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Chemical Age

NEW £6.5 M. NITRA-SHELL PLANT OPENED

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VOL. 81 No. 2081

30 May 1959

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INDEX TO ADVERTISERS

The first figures refer to advertisements in **Chemical Age Directory & Who's Who,** *the second to the current issue*

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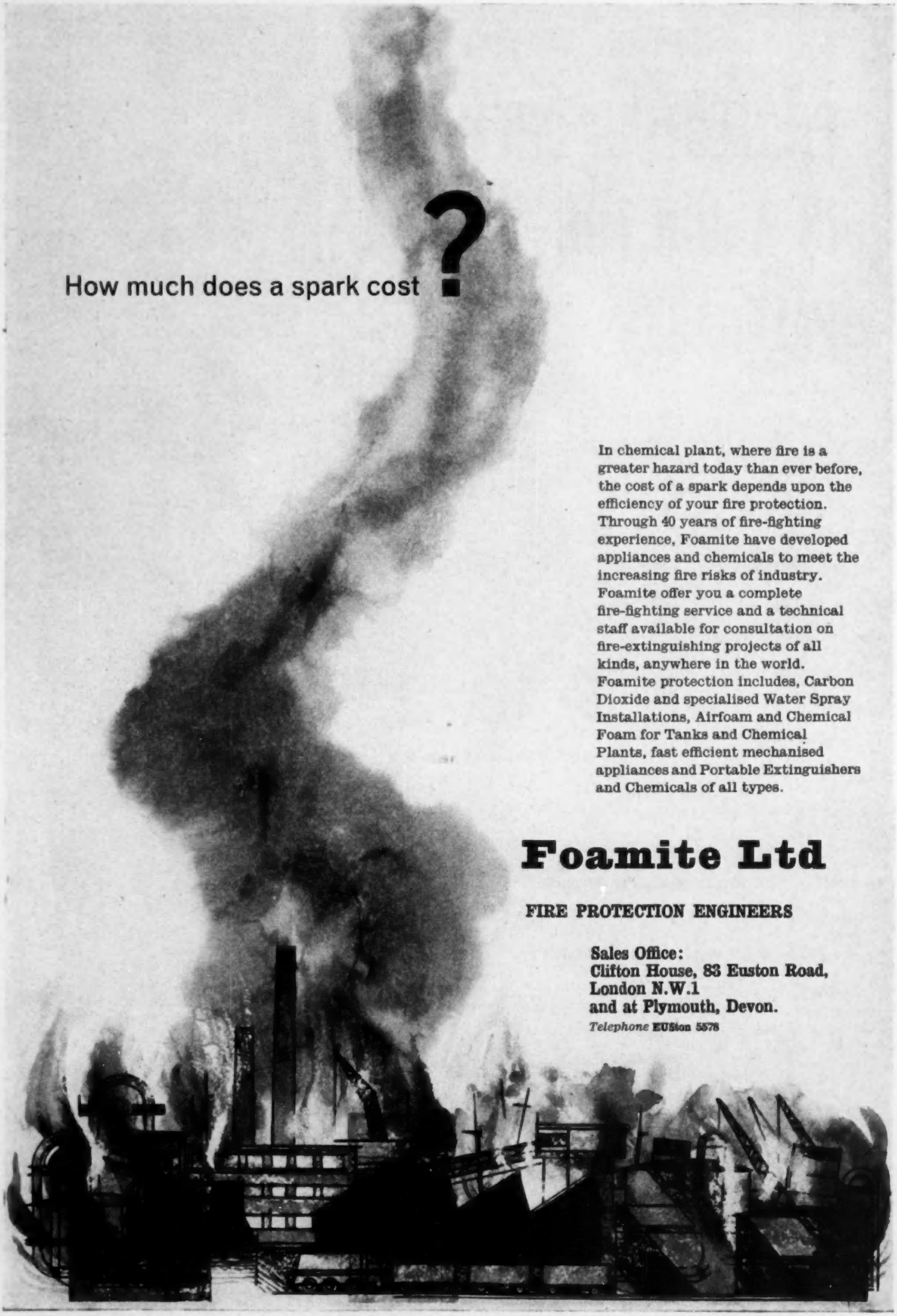
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IN THIS ISSUE

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B

CHEMICAL AGE

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THE NEED FOR FERTILISERS

THERE are about 2,800,000,000 people in the world today and it is estimated that this population will have doubled by the year 2000. Growth in population is posing for mankind the greatest problem in the world today—How can population growth be matched with an adequate increase in food production? As Mr. F. A. C. Guepin said at the opening of Shell Chemical's fertiliser plant at Shell Haven (see page 889) on Friday last, Napoleon's view that population would always increase to the limit of the means of subsistence, and would only be checked by war, famine and pestilence no longer holds, and we are back with Thomas Malthus who propounded that population, if unchecked, increased in a geometrical ratio —while subsistence can only increase in arithmetical ratio. To look to the future, therefore, Mr. Guepin proposed bold technological advances, particularly in the field of agriculture, agricultural engineering and agricultural chemicals.

The Duke of Northumberland, who opened the new Shell Haven fertiliser plant and who is chairman of the Agricultural Research Council, said that so far as agriculture was concerned, we were fortunate in that, through the Government's wise policy, we had a series of research institutions unrivalled in the world today. Similarly our agricultural industry is an advanced and progressive one, having undergone in recent years a great technical revolution. During the past 20 years, farm practice has been transformed and farm output is now 63% up on 1939. In particular, fertiliser developments have been little short of revolutionary, the Duke considers.

In 1837 fertiliser materials in general use were farmyard manure, lime, marl, composts, ashes, soot and waste from bone and other factories. Large quantities of bone were imported at a cost of £250,000. The depression in the 1930's checked our development as a fertiliser manufacturing and consuming country until the outbreak of the second world war. In 1939 farmers used 300,000 tons of fertilisers measured in terms of content of nitrogen, phosphate and potash. In 1957 consumption was over one million tons—a three-fold increase. Of these figures it is interesting to note, as the Duke indicated, that while the phosphate figure has more than doubled, the nitrogen figure has increased five times.

Authorities agree that there is a very considerable potential demand for nitrogenous fertilisers inherent in the future development of our agriculture, and with the present endeavour to increase agricultural efficiency, in intensifying production and increasing crop yields, demand for fertilisers will increase. The increased yields, the Duke of Northumberland stressed, should be thought of in terms of one main objective, that is, a lower cost of production and this should be the main object of this country's research effort.

With this in mind, consideration has to be given to how much fertiliser is economically justified, how fertilisers affect the quality of the products and how much is required to achieve maximum efficiency. Such questions, says the Duke, are difficult to answer for the varied crops and still more varied soils British farmers have to manage. They also give rise to many subsidiary questions in soil chemistry and plant nutrition. The answers are

gradually being pieced together by the National Agricultural Advisory Service. At the same time there is a large and valuable contribution to the solution of these problems by commercial companies.

Use of fertilisers on grassland was specifically referred to by the Duke. Arable crops in this country do not receive sufficient fertiliser while a survey in 1952 showed that in England and Wales more than half of the leys and three-quarters of the permanent grassland received no nitrogen fertiliser—points which CHEMICAL AGE has noted before. The average level of fertiliser usage on grassland has increased somewhat since 1952, but the amount and frequency of application of fertilisers varies considerably. Next year, a National Grassland Demonstration is to be held, the theme of which will be treatment of grass as the nation's most valuable crop and there is thus likely to be increased interest shown in nitrogenous fertilisers.

Much has been heard of late of nitrogen overcapacity, particularly in the U.S. and Western Europe. (See F.A.O. report, CHEMIAL AGE, 28 March, page 533). Some 300,000 tons a year of nitrogenous fertilisers are being used in the U.K., but there is a demand for one and a half times more, i.e. 400,000 to 450,000 tons according to marketing experts. This year will see the commissioning of three large nitrogenous fertiliser works, the present Nitra-Shell facilities of Shell Chemical Co., the new Fison's Stanford le Hope plant, next door to Shell Haven, to be opened officially next month and later on the I.C.I.'s new Texaco oil gasification plant at Billingham for ammonia production now in the process of being started up. Until now U.K. fertiliser manufacturers have been faced with the problem of providing sufficient fertiliser to meet the demands of British farming industry while at the same time maintaining worthwhile export markets. Now it should be possible to satisfy British farmers' needs, stimulate a further and increased demand and reduce overall costs of nitrogenous fertilisers by adequate production.

POLYBUTADIENE OR POLYISOPRENE?

WHAT will be the U.S. synthetic rubber industry's choise for commercial production—*cis*-polybutadiene or *cis*-polyisoprene? That is the problem which is vexing Goodyear, Texas-U.S. Chemical, Goodrich-Gulf and Firestone. They can either make one or the other or both, but which should come first. Phillips have chosen to operate a 500-ton-a-year semi-works plant for *cis*-polybutadiene and Firestone, having announced that they would build a 30,000 ton-a-year plant at Orange, Texas, to make either of these synthetics may go ahead on polyisoprene. Shell Chemical, however, have already made their decision; they are to set up a 15,000 to 20,000 ton-a-year plant at Torrance, California, to produce polyisoprene. Shell already produce 5 tons a day at this site.

As we indicated recently (CHEMICAL AGE, 25 April, p. 686) there has been overcapacity in butadiene and output at 1.17 million tons is about 70% of capacity. It is estimated in the U.S. that it will be 1965 before the capacity-production gap is filled. Goodrich Gulf, Texas-U.S. Chemical, Phillips and Firestone and Shell have butadiene plants but Shell have taken the plunge for polyisoprene.

In favour of butadiene is its price, now 14.5 cents/lb. Isoprene, however, is more expensive and could remain so even if produced on a large scale, since it costs more to make a C_5 raw material than a C_4 material. Shell's selling price for polyisoprene is 30 cents/lb. as against Phillip's polybutadiene at 35 cents/lb. in lots of 5,000 lb. Made on a 25,000 ton-a-year scale, however, polybutadiene could be sold at under 30 cents/lb.

Polybutadiene and polyisoprene both have high elasticity and low-heat build up (an important factor for car and lorry tyres) and they resist oxidation. Polybutadiene is considered as a partial replacement for natural rubber, a 50-50 blend being recommended with natural rubber by some, and Phillips have claimed recently that they have had successful road tests with tyres composed of 90% polybutadiene and 10% natural rubber (needed to prevent the polybutadiene from crumbling during processing and in lending tack during tyre fabrication). Indeed, Phillips say that tyres of polybutadiene wear better than those from natural rubber or polyisoprene. Polyisoprene, nevertheless, is at a more advanced level since it has been in pilot-plant stage for several years.

There is much interest in synthetic rubbers at the present time. In London last week natural rubber prices rose to 2s 6d/lb. as against the 2s/lb. at the beginning of this year. This price increase has resulted from a sharp upswing in Singapore. Consumption of natural rubber is now stated to be running some way above production and with large U.S. commercial vehicle sales in prospect, supplies are considered as likely to remain high for some time.

In the U.S. many have predicted that a natural rubber shortage would occur between 1961 and 1963. Natural rubber consumption there dropped, however, to 485,000 long tons last year—about 10% below the 1957 level. This conserved natural rubber is expected to be taken up in the increased 10% consumption this year. Use of natural rubber would be conserved to a greater extent if the higher synthetic to natural rubber consumption continues. The present U.S. ratio of 65% synthetic to 35% natural is expected to change and more synthetic to be used. European and other countries also appear to be increasing the ratio of synthetic to natural consumption. With increasing car production there is a big market for synthetics in tyre production, and the newer synthetics are likely to capture a large part of this market. Replacement of 50% natural rubber in tyres by synthetics would mean a 340 million lb. market in the U.S. and a sizeable market in the U.K.

There have been no indications in this country regarding plants for either polybutadiene of polyisoprene. There are suggestions that I.C.I. are interested in both these synthetics and may even have a polybutadiene pilot-plant. Shell Chemical would be the likeliest to set up polyisoprene facilities and, of course, there is Esso's butyl rubber which is now going into commercial production in the U.S. for car tyres.

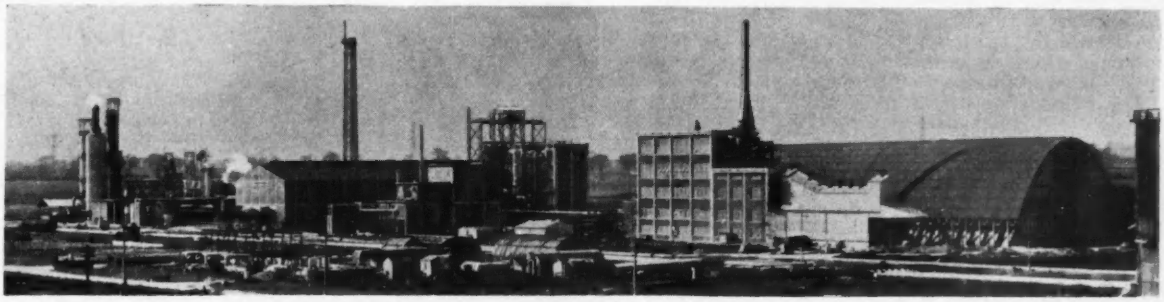
ETHYLENE–PROPYLENE COPOLYMER

FROM Italy comes news that Montecatini have begun semi-commercial production of their ethylene-propylene copolymer, C23. This synthetic is considered to have possibilities for car tyres and it appears that the copolymer may well sell for less than styrene-butadiene rubber or butyl rubber, now priced at 23 cents a pound, for ethylene and propylene are the cheapest starting materials at present available for a synthetic rubber.

C23 is made by stereospecific polymerisation of the olefins using catalysts developed by Professor G. Natta. It is reported to have high resistance to oxidation, ageing and heat, and also to show marked resistance to wear. The copolymer is, in fact, compared with butyl rubber in respect of solvent, sunlight and ageing resistance and is claimed to be better than natural rubber and styrene-butadiene.

Vulcanisation with conventional rubber processing equipment is possible, Montecatini state. Vulcanisation methods used, however, differ from conventional ones suitable for unsaturated rubbers and are designed to cross-link the copolymer's saturated molecules. Properties of vulcanisates as designed for various applications have shown excellent reproducibility, it is reported, and permeability to gases is very near to natural rubber. Mechanical properties appear to lie intermediate between natural rubber and butadiene-styrene copolymers.

SHELL'S NEW £6.5 M. FERTILISER PLANT



General view of the Shell Chemical fertiliser plant at Shell Haven

Facilities for Oil Gasification, Ammonia, Nitric Acid and Nitra-Shell Opened

ADJACENT to Shell's 8 million tons-a-year crude oil refinery at Shell Haven, Stanford-le-Hope, Essex, is Shell Chemical Co. Ltd.'s manufacturing unit for production of chemical fertiliser. The plant has a capacity of 75,000 tons of ammonia a year, 60,000 tons of which will be sold as such; the balance, 15,000 tons will be used by the company to manufacture ammonium nitrate/chalk fertiliser (Nitra-Shell) for the U.K. market. The plant is stated to have cost more than £6.5 million to construct.

Mr. L. H. Williams, managing director of Shell Chemical Co., informed visitors to the official opening on Friday of last week, which was performed by the Duke of Northumberland, that five years of intensive effort had gone into the building of this plant. It is not yet fully operative; the air separation and ammonia units came into operation last November and the nitric acid unit will come on stream this week. Mr. Williams said that the present plant was the first stage in the company's development. They hoped to expand the tonnage in due course and to to have a variety of products to offer the market.

Air separation unit. A Linde-Frankl air separation system is operated. Compressed air is cooled in stone-filled regenerators to within a few degrees of its dewpoint; it is then partially liquefied and finally rectified in a two-sectioned column to produce 95% pure oxygen and a nitrogen fraction containing not more than 0.1% of oxygen. Before leaving this unit, the cold products 'give up their cold' to the regenerators, which in turn cool down the incoming air. G.E.C. air compressors are being employed. For the nitrogen fraction Harland and Wolff compressors are used which take the gas from 130 p.s.i. to 2,500 p.s.i. The oxygen compressers are prototypes provided specially for Shell by the Swiss Berkhardt company. Liquid oxygen is being conveyed in stainless steel pipes.

Partial oxidation unit. Hydrogen for the ammonia synthesis is derived from gas prepared from fuel oil by the Shell gasification process. This is based on the non-catalytic partial oxidation of hydrocarbons and has the following features: feedstock may range from methane to heavy fuel oil; operation may be at any pressure above atmospheric; most of the heat developed by the reaction may be recovered as high pressure steam; equipment is compact and carbon formed during the partial oxidation is easily and efficiently scrubbed from the gas; provision is made for the complete separation of carbon from the wash water which may then be recycled while the separated carbon is used as fuel. The carbon is pelleted on the spot and is fed by hopper into the steam-generating boilers.

At Shell Haven, heavy fuel oil is used as feedstock and the synthesis gas is prepared in four reactors.

Synthesis gas purification. This involves primary hydrogen sulphide removal, carbon monoxide conversion, final hydrogen-sulphide material, carbon dioxide removal and final purification.

Primary hydrogen sulphide removal. Raw gas from the partial oxidation unit contains, in addition to hydrogen and carbon monoxide, some carbon dioxide, up to 1% vol. of hydrogen sulphide (depending on sulphur content of feedstock) and lesser amounts of methane and carbonyl sulphide. Because of the relatively large quantity of H_2S to be removed, and high CO_2 content, a Shell phosphate process has been installed. In this system tripotassium phosphate absorbs H_2S and some of the CO_2 under elevated pressure at ambient temperature or a little above, and is regenerated by boiling the solution at lower pressure. Outlet gas after treatment contains about three-quarters of its original content of CO_2, but H_2S is reduced to about 0.01% vol.

Carbon monoxide conversion. After treatment by the Shell phosphate process, desulphurised synthesis gas passes to the carbon monoxide converter, where, by reaction with steam, carbon monoxide is converted to carbon dioxide and hydrogen. The reaction takes place in two

Shell Haven Processes in Brief

★ **IN the various plants at Shell Haven where air, oil and chalk are used to make ammonia, nitric acid and Nitra-Shell 80 people are employed. Ammonia is made by combining nitrogen and hydrogen in the presence of a catalyst. Nitrogen is obtained by liquefying air and separating the liquid nitrogen and liquid oxygen by fractional distillation. Hydrogen is obtained by burning oil in a restricted amount of oxygen in the presence of steam and under controlled conditions so that the main products are hydrogen and carbon monoxide.**

★ **MORE hydrogen is obtained by reacting steam with the carbon monoxide over a catalyst. The hydrogen is purified in a series of plants, mixed with the right amount of nitrogen, compressed and passed over another catalyst. The ammonia so formed is kept under pressure and is stored in liquid form in a 1,000 ton sphere. Part of the ammonia is sold or used as such; the rest will be burnt in air in the pressure of a catalyst to give oxides of nitrogen, for nitric acid production. Some of the nitric acid will be sold as such; the rest will be neutralised with ammonia to give ammonium nitrate. This mixed with specially treated chalk yields Nitra-Shell.**

★ **CAREFUL attention has been paid in this new plant to prevent air or water pollution. A special unit has been installed to prevent emission of nitrous fumes and an elaborate system has been set up to prevent dust emission from the drying and grinding of chalk and the preparation of granulated fertiliser.**

parallel reactor systems and employs an iron/chromium catalyst. The incoming gas is first saturated with water vapour, then heat exchanged against hot partially converted gas and finally superheated steam is added just before the gas enters the converters. The greater part of the carbon monoxide is converted in the upper catalyst bed and there is a sharp rise in temperature. The partially converted gas is cooled by heat exchange with incoming feed and passes to the lower catalyst bed where conversion continues until the carbon monoxide content of the outlet gas has been reduced to a low figure.

Final hydrogen removal. Synthesis gas from the CO converter contains about 0.05% vol. H_2S, which is rather higher than the H_2S content at its inlet, owing to the conversion of carbonyl sulphide to CO_2 and H_2S. It is essential to remove this H_2S before the synthesis gas reaches the CO_2 absorption unit. The method adopted is oxidation to sulphur by passing the gas, to which a little oxygen has been added, over activated iron oxide. H_2S content is then reduced to a negligible value. The H_2S plant which is in the refinery section, is not yet finished, but is expected to be operative by the end of this year. H_2S from the fertiliser plant will be piped to this unit and sulphur as such will be the end product. Shell plan to sell sulphur on the open market.

The new £2 million plant, a hydrodesulphuriser, removes sulphur by the Shell 'trickle-phase' technique which was the basis of the first unit of this type to come into operation at Shell's Stanlow refinery. The unit will produce 20 tons of pure sulphur a day.

Carbon dioxide removal. On leaving the oxide boxes synthesis gas still contains 40% CO but has had all other major impurities except CO_2 stripped out. A modified hot potassium carbonate process is used, the modification consisting in the addition of a promoter, which leads to higher absorption and desorption rates of CO_2. Final removal of CO_2 is completed by a two-stage caustic soda wash. Synthesis gas contains at this stage, besides hydrogen, some CO, a little nitrogen, argon, methane and oxygen and traces of CO_2.

Purification Process

Final purification. All the above mentioned contaminants are removed before the synthesis gas can be charged to the ammonia synthesis reactors. This is accomplished by scrubbing the gas with pure liquid nitrogen using an air liquid packaged plant when CO, methane, argon and oxygen are all liquefied and dissolved in the excess liquid nitrogen; purified hydrogen containing negligible amounts of impurities and mixed in the correct proportions with pure nitrogen passes to the ammonia synthesis section.

Ammonia synthesis. For the actual ammonia synthesis, the Fauser-Montecatini process has been adopted. This operates at 250 to 350 atmospheres and has the advantage that the heat of reaction is used for generation of steam in waste heat boilers. Cold feed together with recycle gas entering the reactors passes through heat-exchangers countercurrent to the reacted gas and enters the catalyst area. Heat of reaction is absorbed in coils through which water is circulated in closed circuit. This in turn rejects the heat to boiler water for steam raising.

The converted gas is further cooled, first by incoming feed and then by cooling water. Output capacity is 225-230 tons a day. At present some 100 tons a day are being produced; liquid ammonia is collected in the primary ammonia flash vessel. Flashed gas released here contains some nitrogen, hydrogen, argon and methane and is recycled to the suction of the feed gas compressor, while the liquid ammonia goes to storage. Unconverted gas and ammonia vapour flow from the top of the primary ammonia separator to the suction of the circulating gas compressor and further ammonia separates as liquid in the secondary ammonia separators. Recycle gas from the top of the secondary separator forms the fresh feed to the reactors, while the liquid joins that from the primary separator and passes to storage. Liquid ammonia is pumped from storage by the ammonia shipping pumps to Fisons Ltd. Measurement is normally by flow meters, but a weigh tank is provided to allow for periodic checking of the flow meters. Liquid ammonia is also used for refrigeration purposes in the Shell Chemical fertiliser plant and the vapour returned is used as feedstock to nitric acid and ammonium nitrate plants. Any return above that required for the refrigeration sections is compressed and returned to liquid storage.

F. A. C. Guepin, chairman of Shell Chemical (left) and L. H. Williams, managing director

Nitric acid manufacture. This falls into two parts: oxidation of ammonia over a catalyst to nitrogen oxides followed by absorption of the oxides in water to yield nitric acid. The method which will be operated at Shell is as follows: ammonia vapour is preheated and mixed with primary air before entering the reactor where burning to nitric oxide takes place on the surface of the platinum catalyst. The heat of reaction is removed (1) in a steam superheater; (2) in a waste-heat boiler; (3) by heat exchange with tail gas; (4) by heat exchange with boiler-feed water; and finally in water coolers. The process gas, enriched with secondary air which has previously been used for bleaching raw nitric acid, enters the oxidation towers where the nitric oxide is oxidised to nitrogen dioxide and then passes up the absorption towers countercurrent to dilute nitric acid. Make-up water is injected at the top of the second tower at such a rate that concentrated acid of the desired strength flows from the bottom of the first tower. The acid is then bleached by countercurrent stripping with secondary air. Some 320 tons of 58% acid will be produced daily. The greater part will be sold to Fisons Ltd. for their Stanford-le-Hope fertiliser plant and the rest will be used by Shell for their own Nitra-Shell. Tail gas from the top of the second absorber still contains traces of oxides of nitrogen. To avoid possibilities of air pollution, these traces of oxides are reduced to nitrogen by fuel gas over a catalyst developed by Engelhard Industries Ltd., the final effluent containing only 10% of that originally present. Heat energy of this tail gas is recovered by cooling it in a waste heat boiler and finally discharging it to atmosphere through an expansion turbine.

Nitra-Shell Process

Nitra-Shell production. Nitra-Shell, previously supplied to the U.K. from Shell's Dutch plant, is now prepared from chalk and ammonium nitrate manufactured from the ammonia and nitric acid produced at Shell Haven. In the design of the plant where manufacture operates at a constant rate throughout the year and large quantities of solids are involved, stress has been laid on mechanical handling and automatic control. A drying and powdering of chalk and sizing of Nitra-Shell creates dust, attention has been paid to removing dust from all gas and air streams before these are discharged to atmosphere. Chalk taken from the dry chalk storage hopper is carried by a screw conveyor to a second hopper where it is joined by the fines removed in the bag filter, and then transported pneumatically to the hopper from which it is fed to the process. Gaseous ammonia from the synthesis unit is neutralised in the saturator by nitric acid from the ammonia oxidation plant. A considerable amount of heat is released by this reaction, causing most of the water to vaporise and leave the system as superheated steam. From the saturator ammonium nitrate containing a little water flows to the concentrator where most of the latter is flashed off under reduced pressure, and the almost water free ammonium nitrate passes to the mixing granulator, where it is joined by a mixture of powdered chalk, Nitra-Shell fines and crushed over-size Nitra-Shell particles. From the granulator the semi-plastic mass flows to a rotary drier where the Nitra-Shell particles are completely dried, screened to remove oversize bumps and lifted by a bucket conveyor to a double deck sieve where final grading is accomplished. Optimum particle size is about 2.5 mm. in diameter; oversize particles are crushed and together with undersize particles fall to the recycle conveyor which carries them back to the granulator. The graded product is carried by a vibrating conveyor to the powdering drum where it is mixed with the total dry chalk flow delivered from the dry chalk hopper. The powdered granules are separated on a final sieve from the bulk of the chalk which is then carried by the recycle conveyor to the granulator.

Main contractor on the site was the Lummus Co. Ltd. with Constructors John Brown as the chief sub-contractors.

Chemical Executives to Give Frankfurt Papers

SIX papers by top executives in the chemical and plastics industries will be a feature of the annual meeting of the Overseas Section, Society of Chemical Industry. This will be held in the Palmengarten, Frankfurt-on-Main on 11 and 12 June.

Papers will be given as follows: 'Present state of our knowledge of elastomers,' by Prof. Baumann, research director, Chemische Werke Hüls; '25 Years of Polyolefins,' by Dr. J. Swallow, chairman I.C.I. Plastics Division; 'Synthesis of ammonia: its contribution to the development of modern chemical technology and its economic importance for the nitrogen supply of the world, by Dr. B. Timm, director, B.A.S.F. 'German chemical industry in relation to the Common Market,' by Prof. A. Haberland, director of Farbenfabriken Bayer; 'Chemicals from petroleum—a reassessment,' by W. F. Mitchell, Shell International Chemical Co. Ltd., and Bataafse Internationale Chemie Mij.; and 'Organisation of scientific research in the U.K. in the civil field,' by Sir Harry Melville, secretary, D.S.I.R.

In addition to the papers there will be a reception held by the Verband der chemischen Industrie and visits to the B.A.S.F. works, Ludwigshafen, and to Farbwerke Hoechst at Hoechst.

Those intending to be present should contact Mr. F. H. Braybrook, hon. secretary of the section, at 14 Belgrave Square, London S.W.1. Reservations for the section's annual dinner should be made to Mr. J. C. Sington, Deutsche Shell A.G., Shellhaus, Hamburg 36, with a remittance of DM40.

Heating Process Vessels by Electricity

AN exhibition of particular interest to the chemical industry is being held this week by the Merseyside and North Wales Electricity Board. Its purpose is to demonstrate the versatility of electrical surface heating in industry and has been arranged in collaboration with Isopad Ltd. The principal exhibits were: Isomantles for chemical process vessels of 5-500 gall. capacity, including an Enamelled Metal Products Ltd. vessel, a sulphonating pot by Clark Ltd., and a 6-gall. stainless steel container by Taylor Rustless Fittings Co. Ltd.; Maine frequency induction heater; 100 l. distillation unit by Q.V.F. suitable for flameproof areas; Isopad heating system for road tankers; heaters on Audco, Newman Hender and Saunders valves; Isotapes for pipe tracing and fire protection and models of fuel oil installations; heating of LaBour pumps. Gilbarco flow meters and Morton and Hobart mixers; horizontal and vertical Isodrum heaters.

In the section for laboratory applications there was the Pye argon chromograph with column heated by an Isojacket to 250°C with 0.5°C accuracy. J. W. Towers and Co. Ltd. displayed Isomantles featuring glassware.

BILLINGHAM C.C.F. PLANT HAS 300,000 TONS-A-YEAR CAPACITY

THE concentrated complete fertiliser (C.C.F.) plant commissioned last autumn by I.C.I. Billingham Division and visited by 400 of the company's farm agents last month (see CHEMICAL AGE, 25 April, p. 696) is the largest granular fertiliser in the U.K. and one of the largest in the world. The C.C.F. produced contains 42 units of plant food in the ratio of 12% N, 12% P_2O_5 and 18% K_2O.

Capacity of the plant is about 300,000 tons a year; no cost figure has been given.

The Dorr-Oliver granulation process is used and is similar to that employed at the Leith C.C.F. plant of Scottish Agricultural Industries Ltd. opened last year by Sir Alexander Fleck and described in CHEMICAL AGE, 22 March 1958, p. 542.

One of the two Head Wrightson rotary driers at the Billingham C.C.F. granulation plant

In the Billingham plant the process starts with the grinding to a fine powder of North African phosphate rock $(Ca_3(PO_4)_2$. With sulphuric acid (produced by the roasting of anhydrite $CaSO_4$ which is mined at Billingham) it is reacted to give phosphoric acid and by-product gypsum which are separated by filtration. After neutralisation, phosphoric acid is joined by Billingham ammonia (NH_3) and by evaporation, monammonium phosphate liquor is concentrated before mixing with Billingham sulphate of ammonia—$(NH_4)_2SO_4$—and muriate of potash—KCl. Mixing and pre-granulation of solids and liquor takes place in a Dorr-Oliver blunger. Granulation is completed in two Head Wrightson driers measuring 90 ft. long and 12 ft. in diameter. These have a capacity of 500 tons each and work at an initial drying temperature of 400°C and an exit temperature of 100°C+.

The material is then screened and fines are returned to the blunger for reprocessing. Granules of correct size are stored in an air-conditioned silo that has a capacity of 50,000 tons. Next stage is packing into either paper or jute sacks. In the case of the former, sacks are either of the stitched or valve filling variety. After automatic filling, sacks are automatically conveyed to a modern loading platform which has facilities for rail and road loading.

Seventeen thousand five hundred ft. of rubber lining was used to protect the scrubbing boxes and associated ducting in the plant from corrosive vapours in the gases reaching them from the drier. A special rubber compound was used to withstand traces of fluorine. The work was done by the Dunlop Rubber Co., a member of the plant lining group of the Federation of British Rubber and Allied Manufacturers.

Billingham's source for sulphur, the anhydrite mine 850 ft. below the factory, has just seen completion of a 12-year modernisation project that has cost £750,000. Each week 23,000 tons of crushed anhydrous calcium sulphate are brought to the surface. The vast network of mine workings is growing by nearly an acre each week and although more than 20 million tons of anhydrite have already been produced no shortage is envisaged for several generations

Hooker Chemical Set Up European Liaison Office in London

A LONDON office has been set up by the Hooker Chemical Corporation Niagara Falls, N.Y., as a base for liaison between the U.S. firm and European companies with four major objectives so far as chemicals and plastics are concerned. These are to keep abreast of chemical and plastics research and development in Europe; to seek new products and processes for utilisation in the U.S.; to investigate possible joint ventures in Europe and in the U.S.; to assist in bringing to Europe new developments pioneered by Hooker and making them available for foreign use.

Dr. Basil V. de G. Walden who has represented Hooker since April 1958, is the company's chief European representative. He is assisted by Mr. Alexander A. Ostrowski, B.A. Responsible to Hooker's general development department, director of which is Dr. Marion B. Geiger, they will handle all liaison matters except export sales which will continue to be controlled by Mr. W. E. Buchenhorner, manager, export sales, at the company's New York City offices at 60 East 42nd Street.

★ New Nitra-Shell fertiliser plant at Shell Haven is the first stage in the Shell Chemical Co.'s plans, for the company has hopes of being able to offer a variety of products from this site. This intriguing statement was made by Mr. L. H. Williams, managing director, at the opening of the plant last week (see p. 893). I was told that there is room for triple expansion on the north side of the plant. The site can, in fact, accommodate five units such as that described in p. 893.

With regard to the variety of products mentioned, I gather that Shell Chemical have given thought to urea production. It is noteworthy that the Fauser-Montecatini ammonia synthesis process is being operated at Shell Haven. Shell Chemical in the U.S. have a 36,000-ton-a-year Montecatini urea unit operating at Ventura, Ca. Attractive feature of the Montecatini process is the liquid recycle step—either partial or total—designed to return unreacted NH_3 and CO_2 to synthesis reactor. To produce urea, liquid ammonia and CO_2 are reacted with an ammonium carbamate stream. Unreacted NH_3 and CO_2 is vaporised leaving mainly urea and water. Gas phase of NH_3 and CO_2 is drawn off and condensed forming an aqueous solution of ammonium carbamate, which can be recycled. It will be seen from our report that raw materials NH_3 and CO_2 are available and that site facilities for more plant are adequate. The urea could of course be used either for fertiliser or for plastics production.

For the past two years Nitra-Shell has been imported from Holland, the product bearing an import duty of £4 per ton; this duty will be saved in future. No price for the U.K. product has yet been announced. Cost of production, however, should be greatly helped by sales of ammonia and nitric acid to Fison's nearby Stanford-le-Hope fertiliser works due to be opened early in June and later from sulphur sales when the sulphur recovery plant is operating.

★ It was significant that at two of the largest and newest British fertiliser works last week mention was made of the possibilities of bulk distribution. At Shell Haven I gathered that Shell Chemical have given some thought to the delivery of liquid ammonia to farms by tanker. At I.C.I.'s Billingham C.C.F. plant, Mr. E. A. Blench, production director, stated that bulk distribution was likely to come, but that I.C.I. had no plans for such a development at present.

Neither Mr. Blench nor his colleagues thought distribution of concentrated fertiliser in liquid form to be an economic proposition, although this is done by some small companies in the U.S. As far as concentrated fertilisers are concerned bulk distribution in liquid would involve the use of about two or three tons of water to every ton of granular material.

Modern techniques in the handling of granules should make it possible to convey C.C.F. by the tank-load to a network of farm agents. Recent advances in avoiding caking should help to make such a step feasible. It would certainly make for a cheaper product and it seems that a company undertaking research and trials would do the farming community—and the ultimate consumer—a great service. It would be a pity if British companies through lack of enterprise should decide to wait for the idea to be developed in the U.S. or on the Continent.

★ Competition No. 4 of the *M. & B. Laboratory Bulletin* set entrants the task of composing a limerick exploiting an authentic chemical name. Competitors were obviously influenced by the Lehrer cult for their favourite subjects were Death by poisoning, Sex by hormones, and Intoxication by anything but alcohol.

First prize of £5 5s went to D. D. Perrin, of Canberra, a reader of 'Distillates' whose entry I forwarded. His limerick can be classed as 'classic':

A mosquito was heard to complain
That chemists had poisoned his brain.
The cause of his sorrow
Was *para*-dichloro
Diphenyl-trichloro-ethane.

I also liked C. C. Bell's contribution:

An eccentric gourmet from Chester
Indulged in a drink that obsessed her.
She boosted her ego
With nips of erythro-
Hydroxylamino triester.

Next competition should stimulate further original thinking. Competitors are asked for the 'famous last words' (real or imaginary) of two eminent scientists of the past. These should comment aptly on the life, the philosophy or the ultimate predicament of the scientists chosen. Lavoisier, Leblanc, Dalton and Paracelsus should provide good material.

★ Although the Alkali Inspectorate is now responsible for 3,412 separate processes carried out at 2,160 works, a great increase over the previous year, only one process is destructive. This is the burning of wastes produced in the course of organic chemical reactions which occur during the production of materials for the fabrication of plastics and fibres. Liquid wastes are easier to burn as oil burners atomise the liquid into a furnace. The smokeless combustion of some of the solid wastes, however, often leads to difficulties and much experiment is needed to improve the plants.

Burning of chemical wastes, says the chief alkali inspector Dr. J. S. Carter, too often fails to receive the attention it deserves. It is frequently carried out haphazardly with little or no proper supervision. The result is a considerable nuisance which is often avoidable. He considers that as much thought should be put into the design of the incinerator as is the case with a production unit.

The inspectorate accept that there are some residues, particularly from nitration processes for, which it may from an explosive hazard, be unsafe to design and operate a plant. Then burning in the open with all its disadvantages may well be the only solution.

★ The recently imposed restrictions on dangerous goods traffic using the Mersey Tunnel has led Widnes Chamber of Commerce to express its "serious concern". These restrictions, which cover certain chemicals from Merseyside factories, apply to transit through the tunnel between 8.15 a.m. and 10.15 a.m. and 4.15 p.m. to 6.15 p.m., Mondays to Fridays.

The Widnes Chamber takes the view that the vital importance of assisting the movement of materials which are mainly for export, far outweigh the needs of private users of the tunnel.

It is considered, however, that exporters should be able to arrange with the shipping companies to receive dangerous goods at times other than during the tunnel rush hours. It is unlikely that the new restriction will be lifted.

★ Contract to build the £1 million Dowpon plant of Dow Agrochemicals Ltd. at King's Lynn has been awarded to Constructors John Brown Ltd. who start construction work in July. Completion is scheduled for July 1960. This will be C.J.B.'s second contract in the King's Lynn area for they have recently completed a factory for Campbell's Soups.

The Dowpon site is on the banks of the Ouse. C.J.B. have undertaken to contract civil, mechanical, electrical and instrument engineering. They will also be handling design, procurement and erection. Mr. W. Clements is project manager for C.J.B. and Mr. W. Fletcher is project engineer, Mr. J. Warburg is chief engineer of Dow Agrochemicals.

This is certainly a busy period for C.J.B. Recently I gave the exclusive news that they were likely to be awarded the I.C.I. polypropylene contract; it is not yet possible to confirm this development. C.J.B. have also recently completed their part on two major contracts; as main sub-contractors to Lummus on the Nitra-Shell plant; and as main contractors on Chemstrand's Acrilan plant in Northern Ireland.

Alembic

CHIEF ALKALI INSPECTOR'S REPORT

Precipitators Combat Acid Mist: 120-ft Chimneys for Fertiliser Manufacturers

TWO features of the Chief Alkali Inspector's report for 1958 were the increasing and effective use of electrical precipitators to arrest acid mist and the fact that all fertiliser manufacturers in England and Wales are being asked to install stacks at least 120 ft. high. The report also carried a lengthy review of sulphuric acid works.

The report (95th Annual Report on Alkali etc. Works, England and Wales—H.M.S.O., 3s 6d net) also notes the fact that the responsibilities of the inspectorate have greatly increased since 1 June 1958 when the Alkali Act was extended to cover a further 11 classes of works. By the end of 1958 the number of works registered under the Act had risen from 872 to 2,160 and the number of separate processes from 1,733 to 3,412.

The newly scheduled works are iron and steel, copper, aluminium, electricity, producer gas, gas and coke, ceramic, lime, sulphate reduction, caustic soda and chemical incineration works. The list of noxious or offensive gases was also extended to include acetylene, compounds of ammonia and fumes containing aluminium, iron and chlorine and their compounds.

Dr. J. S. Carter, the chief inspector, said that the number of districts had been increased from seven to 12. Visits and inspections in 1958 totalled 7,142. The number of quantitative analyses made, 1,793, was less than for 1957 due to preoccupation with the training of new inspectors, enquiries and investigations into the new processes. The Alkali Inspectorate is expected to make even heavier demands on the Government Chemist's department because of its new responsibilities.

Complaints investigated, mainly at the request of local authorities, related to 270 works in 1958 compared with 133 in 1957. Complaints were most numerous against ceramic works (43), gas and coke works (36), electric power stations (27), iron and steel works (20), aluminium works (13) and cement works (11).

Since the works newly registered were without "best practical means for dealing with their noxious or offensive gases" they were in a state of technical infraction until their individual emission problems were solved. As a working arrangement infractions have been confined to the pre-1958 processes.

Of the 12 infractions (17 in 1957) six related to escapes of acid gases in excess of statutory limits and six to failure to use "best practical means". Suitable action was taken and there had been no resort to legal proceedings.

Unregistered Processes. Lachrymatory emissions from a plant producing phthalic anhydride had caused complaints. The process was the standard catalytic oxidation of naphthalene and the tail gases after passing through a cyclone and a crude water scrubber were discharged to air by a 25 ft. stack. In addition to uncondensed phthalic anhydride, the tail gases contained traces of naphthaquinone and maleic anhydride. The company had ordered a new type of condensation unit and a more efficient water-irrigated, coke-packed tower. It was considered that height of discharge should be not less than 120 ft. and that water used as scrubbing medium might be replaced by a soda solution.

Alkali Works. Of 56,200 tons of salt used in the saltcake process in 1958, 34,000 were processed at two works; a new works in South Wales started up towards the end of the year. There were two infractions during the year. The first was due to some carry over of spray, which was speedily rectified. The other occurred following overhaul when considerable trouble was experienced in obtaining balanced conditions.

Average of all tests during the year was 0.099 gr. hydrogen chloride per cu. ft. The efficiency of condensation of the hydrogen chloride produced was 97.3%, the statutory requirement being 95%.

Cement Production. Production of cement in England and Wales totalled 10.1 million tons in 1958, and was below the capacity of roughly 12.5 million tons. Capacities of other countries were given in millions of tons as: U.S. 53; U.S.S.R. 25; Germany 20; Japan 13; Italy 11; France 11.

Sulphuric Acid. Production in 1958 was 2,023,000 tons as monohydrate, compared with 2,137,000 in 1957 and 821,000 in 1938. The proportion of acid made by chamber and tower processes in 1958 was 19% and by the contact process 81%, compared with 60.3% and 39.7% in 1938.

Reporting on chamber and tower processes, it is stated that installation of means to prevent emission of droplets with waste gases has continued. Any further trouble due to such emission would be treated as a serious offence.

Installation of ceramic filters at one tower plant appeared to have solved the problem of acid mist. At another tower plant, installation of an electrical precipitator to demist the gases was nearing completion. Demisted gases would then pass to air through a 120 ft. stack also nearing completion.

Average of all tests made on exit gases during the year showed an acidity of 1.42 gr. per cu. ft. calculated as sulphur trioxide. The three infractions related to units burning spent oxide; at one works, where the figure exceeded by 3.0 gr. the limit of 4.0 gr. per cu. ft., temperature recorders did not give warning of the onset of abnormal conditions. At another works, trouble related to a batch of spent oxide with a high cyanide content combined with reduced chamber space. At the third, trouble developed with a pump feeding strong acid to the Glover tower and chamber temperatures rose during the repair period.

Local complaint continued almost unabated against one works, despite the installation of an Oldbury type wash tower between the Gay Lussac towers. An arrester was being installed. An Oldbury tower was being installed in another works. Primary purpose of this tower was to condition the state of oxidation of the nitrogen oxides in the gases leaving the first Gay Lussac tower so that they were absorbed in the second; the overall result was to reduce the nitrosity of the escape.

Referring to contact processes, the new registration related to a plant at an oil refinery to produce sulphuric acid from acid sludges. There were now two such units in England and Wales. The three new contact units that had been commissioned at existing works and two others now erecting used sulphur as raw material.

The report referred to interesting developments regarding removal of acid mist from waste gases. At one very large anhydrite process works, where scrubbing of exit gases in towers copiously

TABLE 1

Sulphuric Acid Production (England & Wales

Excluding Government Production

	1958	*1957*	*1956*
		Tons of 100%	
Production	2,023,000	2,137,000	2,056,000
	%	%	%
Proportion of plant in use	80.0	86.4	82.4
Proportion made:			
Chamber and tower	19.0	20.6	21.6
Contact	81.0	79.4	78.4
Raw materials used:	*Tons*	*Tons*	*Tons*
Pyrites	278,000	318,000	332,000
Sulphur, inc. recovered, H_2S and filter cake ...	277,000	293,000	263,000
Spent oxide ...	231,000	252,000	237,000
Zinc concentrates	152,000	159,000	188,000
Anhydrite ...	749,000	737,000	698,000

TABLE 2

Ammonia Products (England & Wales)

	1958 Tons	*1957 Tons*	*1956 Tons*
Conc. ammonia liquor from by-product liquor calculated as 25% strength ...	116,900	113,600	118,200
By-product sulphate of ammonia ...	310,200	334,800	320,000
Syn. sulphate of ammonia	879,700	849,300	821,600
Total production of syn. ammonia calculated as NH_3 ...	442,400	440,200	433,500

N.B.—Some of the synthetic ammonia and some of the concentrated liquor produced was converted to sulphate of ammonia included in the above totals.

TABLE 3

Tar Distilled and Pitch Produced (England & Wales)

	1958 Tons	*1957 Tons*	*1956 Tons*
Total tar distilled to pitch or other residue	2,484,400	2,600,000	2,611,300
Pitch produced ...	1,039,000	1,059,700	1,043,000
Pitch oiled back ...	567,500	653,700	560,000

irrigated with river water failed to remove acid mist, provision of electrical precipitators had led to almost quantitative demisting, the previously heavy emission being now almost invisible. At another anhydrite process works, ceramic filters gave reasonably satisfactory results for the greater part of the year; conditions, however, deteriorated suddenly owing to greatly increased mist formation in the acid plants and failure of the filters to cope with the higher load. Production was reduced to decrease the mist escape; it was suspected that a change in the character of the coke used in the mixture fed to the kilns had some bearing and normal conditions resumed on changing the coke. Although further experiments were in hand to improve filter efficiency, the episode had destroyed faith in the ability of ceramic filters to operate effectively under varying plant conditions.

An electrical precipitator was installed at a brimstone burning works after studying all available mist arrestment techniques. So far results in preventing the emission of acid mist were promising. Electrical precipitators used for demisting at other works continued to operate satisfactorily. Large-scale tests were proceeding at some works with scrubbers of the modified Calder-Fox type and with fibre filters.

Sulphur Trioxide

Discussing concentration and other processes, the report states that rather serious emissions of sulphur trioxide occurred due to two accidents at a works where distillation of oleum was practised. Absence of serious complaint was presumably due to the high temperature at which the sulphur trioxide mist was discharged.

Chemical Manure Works. Pending a more fundamental study of the whole mist production and arrestment problem, the Alkali Inspectorate has asked for chimneys of not less than 120 ft. high wherever there is complaint. A number have already been installed and in every case complaint has ceased. Such chimneys are now a prerequisite for registration of new plants and all existing plants are being asked to install them. "Best practical means" in connection with granulation plants includes cyclone dust arrestors, water scrubbers and a chimney not less than 120 ft. high.

Carry over of acid spray from granulation plants could not be permitted and in future would be regarded as non-compliance with the statutory requirements. The report adds "It is possible that ammonium nitrate may be used on an appreciable scale in granulation in 1959".

Gas Liquor Works. Complaint of emissions from a large works was traced to the tail gases from a Claus kiln. These were now burned under the works boiler fires before discharge to air and complaint had ceased. At another works complaint related to smell from the waste liquor slurry beds due to the fact that the crude liquor supplied contained appreciable amounts of emulsified tar. The odour disappeared with cleaner crude liquor. Other complaints related to the blowing of a seal and consequent leakage of fume and ammoniacal liquor; loading rail tank cars; and unsuitable storage.

Nitric Acid. Low level escapes from cracks in the main absorbers at one works caused concern. Repair was extremely difficult but was eventually completed. Brown emissions from the final exit gas stacks were visible over a wide area and were still regarded with suspicion by local residents. Many of the emissions, particularly where some of the new syntheses were involved, presented chemical engineering problems of some difficulty.

Sulphate and Muriate of Ammonia. There were fewer works, the number being 68, against 78 in 1957, 83 in 1956 and 641 in 1916. Capacity is little affected as most ammonia is now produced in synthetic units.

Chlorine Complaints

Chlorine. Adverse comments made referred to the smaller works. A serious emission of chlorine occurred at a plant engaged in an organic synthesis, where two gases, one of them chlorine, were reacted. Emission was caused by the blowing of a seal consequent on the build-up of abnormal pressure of chlorine due to temporary failure in the feed of the other gaseous reactant. Further control valves had now been installed.

An explosion wrecked the caustic soda waste gas scrubbing system in a small plant for the chlorination of an aliphatic organic compound. Traces of ammonia in the compound led to the formation of ammonium chloride; this sublimed to the roof of the reaction vessel where with excess chlorine it apparently produced nitrogen trichloride which exploded. Elaborate precautions are now taken to exclude all traces of ammonia.

Muriatic Acid. Average escape to air based on the 43 chimneys tested at plants for the evaporation of brine in open pans for the production of common salt was 0.051 g. hydrogen chloride per cu. ft. The real problem here now related to dark smoke; some two-thirds of the salt pans operating were now fitted with mechanical stoking. There was, however, still a hard core of opposition to the abandonment of hand-firing.

Sulphide. The report refers to the vastly difficult problem of dealing with large volumes containing hydrogen sulphide in concentrations usually measured in p.p.m. The most difficult of all the problems related to viscose rayon. Even here progress was made and developments were in hand. This matter would receive particular attention in 1959 and the next annual report would contain a review "of this major problem".

Disulphide of Carbon. Following complaints a new Claus kiln unit for recovery of sulphur from process gases from the disulphide of carbon units was now being erected with provision for treating the tail gases. An unsolved problem related to the gases from the periodical scurfing and de-ashing of retorts. Two techniques are being considered.

Paraffin Oil. Annual throughput of crude and process oils at refineries in England and Wales in 1938 was 2.5 million tons; the 1958 figure was 31 million tons. Petrochemical units operated well, but one complaint dealt with smoke emission from a flare stack during commissioning of new units. A serious accident at one works followed the fracture of an underground gas line and the explosion caused three deaths and injury to a score of other persons.

Bromine. Two of the registrations relate to production of bromine from sea water, the remaining 37 to the use of bromine in the chemical industry. Further technological improvements would enable production at the larger of the two works to be increased in 1959. Bulk of the bromine produced is converted to ethylene dibromide, a component of the anti-knock compound containing tetraethyl lead.

Chemical industry's use of bromine has been reasonably well conducted. Conditions at one works became intolerable within a process building, due to formation of some lachrymatory substance between bromine vapour and solvent thinners vaporising from nearby painting of equipment. The source of vapour was an almost undetectable leak from the gland of a reaction vessel which was being air-purged.

Hydrofluoric Acid. Production of hydrofluoric acid, about three times the pre-war make, had been characterised by the absence of complaint.

Gas and Coke. Oil gasification plants involved a sulphur dioxide dispersal problem, but that was dealt with in each case at the design stage and appropriate chimney heights agreed for each installation. There had been troubles at some works due to emission of oily fumes during the blow period and in some cases to emission of soot. The largest works at the Isle of Grain, capable of producing 20 million cu. ft. per day of town gas, was being brought into commission at the end of the year; further stages would raise production to 60 million cu. ft. per day.

The main technique for the removal of hydrogen sulphide from town gas was still that of reaction with hydrated oxide of iron. Although the classical oxide boxes were still a feature of most works, most gas engineers felt that the future lay either with the newer chemical engineering techniques for accelerating gas-solid reactions or with systems involving liquid purification. All systems could give rise to troubles of smell or gas. The whole matter was under review.

The chief inspector for Scotland's report will be summarised in "Chemical Age" next week.

Evans Medical Open New Laboratories

The Minister of Health, Mr. Derek Walker-Smith, opened Evans Medical's new research laboratories at Speke on Thursday. Completion of the laboratories marks the culmination of a post-war development programme initiated in 1941 when construction of new works at Speke was started.

BURNS AND STEWART DISCUSS OPERATING RESULTS AT ROMFORD GAS REFORMING PLANT

PROVISIONS made to accept the actual and potential raw materials into the North Thames Gas Board's framework of gas manufacture at Romford were described by Dr. J. Burns, chief engineer, N.T.G.B., and E. R. Stewart, station engineer at N.T.G.B's Romford Works, at the 96th annual general meeting of the Institution of Gas Engineers at Llandudno, Wales, this week. Operational results over a period of some nine months were included. Since May of last year when the reforming plant commenced operation, the units have worked throughout in a reliable and efficient manner, it is reported, and flexibility of operation has been a satisfactory feature. It has been found that the refinery gas supply from Shell Refinery Co. could be divided into three main types, characterised by calorific value of about 1,000, 1,500 and 2,000 B.t.u./cu. ft. Knowledge of the constitution of the gas coming into the plant is vital to its successful operation while control of the amount of raw materials is essential to the operation of the supply agreement as well as to the process of reforming. Calorific value of the refinery gas is continuously recorded by a Reïneke calorimeter on a strip chart. The instrument, of German manufacture, has operated successfully over a range and up to 2,100 B.t.u./cu. ft. Hydrogen sulphide is recorded on a Rubicon analyser. Intensity of H_2S is recorded by means of a linen tape impregnated with lead acetate passing between two photo-electric cells. Specific gravity is continuously recorded by a Sigma instrument with a range of 0.5 to 1.4, and hydrocarbon dew-points and water dew-points are recorded.

The plant in use at Romford is of the Onia-Gegi type designed and constructed by Humphreys and Glasgow Ltd. It consists essentially of four identical units, each made up of a preheater, reactor, waste-heat boiler and wash box. The preheater is a mild steel refractory-lined vertical cylindrical vessel 12 ft. in diameter. A set of refractory arches across the preheater supports a section of chequer brick packing, on top of which a layer of sole bricks carries the first catalyst bed of 12 in. depth. The reactor, also of mild steel construction lined with refractories, is 17 ft. in diameter. The catalyst layer is 18 in. deep supported by sole bricks on arches across the vessel. There is a total of 17½ tons of catalyst in each of the four units, one-quarter being in the preheater and three-quarters in the reactor.

With regard to ancillary plant, the gas outlet main from the four washboxes leads to three washer-scrubbers packed with wooden grids, where the gas is cooled by direct contact with water. The steam system has been designed so as to make the plant self-supporting in respect of its process requirements.

Although specification for the refinery gas provided for only 0.5 p.p.m. of H_2S and an organic sulphur content not exceeding 5 gr./100 cu. ft., Burns and Stewart indicated that it had been recognised that the organic sulphur would be converted to H_2S in the reforming process, with production of H_2S just very slightly in excess of the statutory unit. The very simplest form of oxide purifiers have therefore been installed for, apart from pressure requirements, the oxide would require to be changed not more than once in four or five years. The boxes ultimately chosen were supplied and erected by the Oxley Engineering Co. Ltd., and consisted of four deep boxes, each 32 ft. by 12 ft., of welded mild steel, each box being fitted with a single cover and holding two layers of oxide; each has provision for convergent or divergent gas flow (see photograph in CHEMICAL AGE last week, page 857). Quite apart from their function in removing the minute traces of H_2S, the boxes have proved efficient filters for the removal of very finely divided carbon, reported Burns and Stewart. This carbon can arise through maladjustment of the operating sections of the plant, and it is important that this should be removed before the gas leaves the plant.

Reforming Operation

The reforming operation. Reaction between refinery gas hydrocarbons and steam in the presence of a nickel catalyst at 650° to 850° C yields a mixture of CO,CO_2 and hydrogen when reforming is carried to completion. It is stated to be possible to obtain from each therm of refinery gas treated with steam up to 1.24 therms of reformed 'lean' gas with a calorific value up to 300 B.t.u./cu. ft. In practice reformed gas contains methane and will have a calorific value between 310 and 320 B.t.u./cu. ft. During the heating phase, the nickel in the catalyst is progressively oxidised to NiO and Ni_2O_3. These oxides are fully reduced again during the early part of the reforming phase, and control of the rate of oxidation of the catalyst by control of the amount of excess air used for combustion is stated to be a very important feature of the plant operation.

Practical aspects of plant control. Refinery gas supplied to the reforming plant is used in approximately the following proportions: process gas for reforming, 40%; burner gas for heating, 10%; and cold enrichment, 50%. The first important factor to be determined is the correct ratio between process stream and process gas. A suitable compromise has been found by using 1.4 vol. of steam/vol. of carbon in the refinery gas.

Plant temperatures are controlled by varying (1) gas to primary burner; (2) air to primary burner; (3) gas to secondary burner; (4) air to secondary burner; (5) duration of primary burning; and (6) duration of secondary burning. For efficient cracking it is preferable, Burns and Stewart say, to work with as small a temperature gradient as possible across each catalyst bed. Close control of temperatures is facilitated by use of the Honeywell Brown electronic temperature recorder.

Maximum overall plant efficiency is achieved, it is stated, when inert gases are deliberately added to the 'lean' gas in such proportions that final enrichment to 500 B.t.u./cu. ft. yields the highest specific gravity permitted.

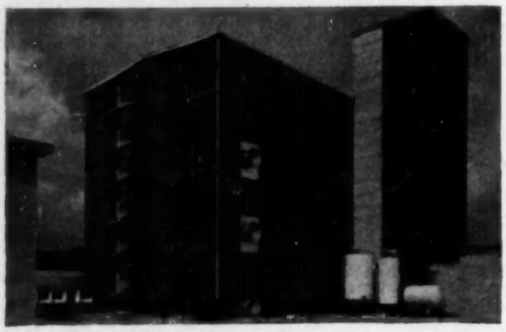
Operational results and plant performance. Refinery gas in the middle range of 1,500 B.t.u./cu. ft. calorific value has been the most abundant and it has been possible to reach an overall efficiency of 93.4% with this gas. There have been no difficulties at all with deposition of carbon when operating in the low calorific value range. Operation on the high calorific value range has shown the lowest overall efficiency and this is associated also with some carbon deposition. Outputs obtained on this plant have been "particularly impressive." A basic figure of 9 million cu. ft./day at the middle range of calorific values was considered possible. Outputs obtained in this range have, however, risen to 13 million cu. ft./day of 500 B.t.u./cu. ft. gas and this extra has provided welcome increased capacity. Outputs obtainable at the lower range of calorific value, amounting to 15 million cu. ft./day are considered to augur well for the outputs likely to be obtained on the reformation of methane.

The final gas leaving the plant is essentially free of sulphur. The CO content of the gas produced from low calorific value feedstock is about 8%, but this increases to 15 to 16% if the calorific value of the feedstock rises to 2,000 B.t.u./cu. ft. It has been found possible to vary output from one unit from 5.3 million cu. ft./set/day up to 13 million cu. ft./set/day. It is foreseen that with experience, it will be possible to widen this range without undue difficulty. Three sets at work have produced a maximum output of 30 million cu. ft./day, which represents the raw material supply available to the board.

With the small amounts of sulphur present, oxygen absorption has amounted only to 2.8 p.p.m., and pH value was 7.2. Settling tanks in the circulation system have proved adequate to deal with the major portion of the carbon, while the small amount remaining in the gas has been successfully trapped in the oxide box purifiers. It has not been necessary to use the water sprays in the booster casings, intended for flushing out carbon.

Operational research. Work is in prospect on the use of primary flash distillate as feedstock to one unit and also in place of refinery gas for heating purposes. The wide range of gas composition that can be achieved on this plant, Burns and Stewart report, makes the board's present studies of the possibility of removing CO, without subsequent removal of the CO_2 produced, particularly interesting.

CIBA'S NEW ARALDITE PLANT RAISES CAPACITY FIVE-FOLD



The new Araldite epoxy resin factory, showing the tower housing the 30,000-gall. water tank

CELEBRATIONS of the 25th anniversary of CIBA (A.R.L.) Ltd. on 21 May included the opening of a new plant for the production of Araldite epoxy resin, a research block and additional wings to the sales offices.

The site at Duxford, Cambridgeshire, was chosen in 1934 by the founder of Aero Research Ltd., Dr. N. A. de Bruyne, as an airfield. From a study of the structure of aircraft there developed research into plastics materials and adhesives.

Araldite epoxy resins were introduced during the war by CIBA Ltd., Basle, who took Aero Research Ltd. over in 1947. The first resins of this type to be manufactured in the U.K. were made at Duxford in 1950. They are made by reacting epichlorhydrin and diphenylopropane.

Capacity Up 500%

The new plant, now in production, has a capacity five times that of the old. It is maintained by three men a shift and its output per man/hour is three times that of the old plant. Accommodation and services have been planned so that capacity can be doubled.

Reinforced concrete clad with glazed curtain walling was chosen for the main building, which has a working area of 16,300 sq. ft. on four floors. The staircase is enclosed in a tower 82 ft. high, the top of which is occupied by a water tank with a capacity of 30,000 gallons.

To reduce fire hazards the control laboratory and the switch house have been built at a considerable distance from the main plant and tanks holding inflammable liquids have been sited away from buildings. A background ventilation system provides five changes of air an hour and additional ventilation can provide a change 30 times an hour.

A striking feature of the brick-built store is provided by four lattice timber trusses of 72-ft. span supporting the roof, for which Aerodux 185 adhesive was used.

Products of the factory are used in many parts of the new buildings. In the new research block the teak benches are glued with Aerodux 185, artificial lighting in the corridors is diffused by means of Aeroweb honeycomb panels and Araldite 820 RH has been used as a surface coating in fume cupboards and other places needing a corrosion-resistant surface.

Long-term research, carried out under the direction of Dr. R. F. Webb, has as a general purpose the discovery of new plastics materials with improved properties such as structural strength, high temperature stability and good electrical properties. The scope of the work is not restricted to adhesives.

Short-term research, under Mr. C. A. A. Rayner, deals with problems associated with customers' use of the company's products. The rapid growth of the chipboard industry, which uses a large tonnage of the company's urea-formaldehyde resins, has made a big programme of research necessary.

In the field of epoxy resins work is in progress to formulate new hardeners. The bonding of stainless steel and adhesives for printed circuits are two other lines of research being pursued.

In addition to these buildings, a new engineering services building is under construction.

The total cost of the new buildings and ancillary work is £500,000.

U.K. Chemical Firms Exhibiting at Lisbon

MANY chemical firms are among the more than 300 British concerns exhibiting at the British Trade Fair in Lisbon from 29 May to 14 June.

The fair is taking place in the first year of Portugal's six-year development plan, on which £375 million will be spent.

Britain exported £2.8 million worth of chemicals to Portugal in 1958, of which £700,000 represented plastics materials and £300,000 pigments, paints, varnishes and related materials. Exports of petroleum and petroleum products amounted to £500,000.

Chemical and allied companies exhibiting include:

A.P.V. Co. Ltd., Crawley, Sussex; Albright and Wilson (Mfg) Ltd., London S.W.1; Edgar Allen and Co. Ltd., Sheffield; Geo. Angus and Co. Ltd., London W.C.1; Audley Engineering Co. Ltd., Newport, Shropshire; W. and T. Avery Ltd., Birmingham.

B.I.P. Chemicals Ltd., Oldbury; Bakelite Ltd., London S.W.1; Baker Perkins (Exports) Ltd., London W.1; Birlec Ltd., Birmingham; W. J. Bush and Co. Ltd., London E.8.

Cochran and Co. (Annan) Ltd.; Erinoid Ltd., Stroud; Evershed and Vignoles Ltd., Chiswick; Firth-Vickers Stainless Steels Ltd., Sheffield; Foamite Ltd., London N.W.1; Foster Instrument Co. Ltd., Letchworth; Griffin and George (Sales) Ltd., Wembley.

Imperial Chemical Industries Ltd., London S.W.1; The Metafiltration Co. Ltd., Hounslow; The Mond Nickel Co. Ltd., London S.W.1; Negretti and Zambra Ltd., London W.1; Oertling Ltd., Orpington.

Saunders Valve Co. Ltd., Cwmbran; Scott Bader and Co. Ltd., Wollaston; Sigmund Pumps Ltd., Gateshead; Sumo Pumps Ltd., London S.W.1; Henry Wiggin and Co. Ltd., Birmingham; Yorkshire Imperial Metals Ltd., Leeds.

Company Taking Over Gas Board Chemical Work

SCOTTISH Tar Distillers Ltd. are to take over chemical production for the Scottish Gas Board under a scheme to simplify working by handing over to specialists.

Reductions in the numbers of employees at Provan chemical works, and probably elsewhere, are expected.

The Scottish Gas Board has a holding of £113,437 in Scottish Tar Distillers Ltd.

New Chemicals from Midland Tar

NOW available from Midland Tar Distillers Ltd., Oldbury, in research quantities (i.e. up to about 1 lb. lots) is a variety of coal tar derived chemicals. The compounds are:

coumarone, 2-methylcoumarone, 3-methyl coumarone, hexamethylbenzene, 2, 3, 6-trimethyl phenol, 2, 4, 6-trimethyl phenol, phenyl allyl ether, *p*-cumyl phenol (2-(4-hydroxyphenyl)-2-phenyl propane), 3-nitro-2,6-tritidine, 3-amino-2, 6-tritidine, 6-methyl picolmic acid, 2, 6-bis-(trichloro methyl)-pyridine, 2-(2-aminoethyl)-pyridine and a number of derived secondary and tertiary amines of the type.

$$Py-CH_2-CH_2-N\begin{cases} R \\ R^1 \end{cases}$$

where R = H or alkyl, R^1 alkyl or R R^1 is cyclic n-propyl 2-(2-pyridyl) ethyl ether—and a number of alkyl pyridyl-ethers of the type $Py-CH_2-CH_2-O-R$. (In both the above Py = 2-pyridyl, 4-pyridyl or 6-methyl-2-pyridyl.

Midland Tar state that they are willing to consider the manufacture of any of these on a large scale should demand arise.

Pyridine N-oxide and the methylpyridine N-oxides have not previously been commercially available; their novel chemical properties are considered to offer new prospects in pyridine chemistry. 4-Vinylpyridine and 2-methyl-6-vinylpyridine can, like 2-vinylpyridine, readily be polymerised and copolymerised with a variety of common monomers. A variety of compounds will add to the reactive double bond of vinylpyridines to give pyridyl-ethyl derivatives.

Picolinic and dipicolinic acids are found to chelate with and sequester metal ions such as Fe^{3+} and Cu^{2+}.

O.C.C.A. POLYMER CONFERENCE—4

Paint Research Station's Work on Polymer Structure and Film Formation

MANY types of surface coatings were mentioned by T. R. Bullett and A. T. S. Rudram (Paint Research Station, Teddington) in their paper on 'Polymer structure and film formation'. While all possess useful and sometimes specific qualities, most have deficiencies, again possibly specific and none will suit every situation. There were good reasons why the ideal universal paint had not been realised, for different properties or different application requirements appeared in practice to call for conflicting structures or film-forming mechanisms, and specialisation was usually necessary. Bullett and Rudram, therefore, suggested that the types of media with the greatest hopes of maintaining and expanding their field of use were those capable, through simple modifications, of the greatest adaptation to varying requirements.

Oil-modified alkyds. In recent years the big step forward in durability had come with development of the oil-modified alkyd resins, which could be regarded as oleoresinous varnishes in which resin was built in with the oil component.

Alkyd-like Structure

It had been suggested that both linseed stand oil and copal varnishes could be regarded as having structures the same as, or similar to, alkyds. Linseed oil stand polymer could be represented as a polyester built from trihydric alcohol and a mixture of monobasic and dibasic acids.

Highly viscous polymers segregated from linseed stand oil by solvent fractionation had been found to dry (in the presence of lead and cobalt) to very hard glossy films with excellent weathering similar to high-quality varnishes or alkyds. Less confidently it could be suggested that the polycarboxylic acids in copal varnishes after esterification, either before or during varnish making, formed alkyd-type polyesters by interchange with the drying-oil esters.

A study had been made of replacement of all parts of the isopropanol extract of an oil alkyd by other low molecular weight material of types less prone to scission reactions. In respect of general film quality partial replacements of extracted low molecular weight material by either non-drying oil or ester plasticisers gave fairly satisfactory results.

The true alkyd, with its synthesis from relatively simple components, escaped such incompatibility of structure noted with natural resin varnishes and there was little doubt that therein lay the reason for the improvement in quality of some aspects of film formation and durability. In terms of durability, oil-modified alkyds offered the greatest potentialities of the materials considered so far.

There was an optimum oil length for most rapid hardening. Indications from studies on a range of linseed oil/glycerol alkyds were that, as the oil length was reduced to 50%, the amount of polymer inextractable with benzene and the film hardness both increased. Thereafter lower oil content resulted in a lower percentage of inextractable polymer and a slower development of film hardness.

Hydrocarbon modified oils and alkyd resins. Modifications with hydrocarbons as another method of associating the supposedly unduly reactive drying oil with less reactive material were considered by Bullett and Rudram. Styrene and vinyl toluene fitted well into this picture; cyclopentadiene, which preserved a reactive double bond after addition to a drying oil chain, was rather different. Epoxy esters which could be regarded as alkyd type structures were also considered. It could be said that, by various hydrocarbon modifications, it had been possible to obtain much more rapid drying and hardening, better resistance to yellowing and to alkali attack, but not improved weathering resistance, as compared with medium to long oil alkyds.

Unexpected Effects

The stiffening effect of polystyrene chains, for example, might have been expected to reduce flexibility and so introduce some tendency for films to crack more readily when strained. That some hydrocarbon modified alkyds and some epoxy esters would chalk more rapidly on exposure than did unmodified long oil alkyds was unexpected. It could only be assumed that the mechanism of erosion for these materials was different from that occurring in oil paints, and it was that thought which had prompted some reconsideration of breakdown mechanisms.

Mechanics of paint film breakdown. Tests were made in which acceleration of the stressing process was attempted by pre-stressing fully hardened oil and varnish paint films mechanically to a point short of failure, by linear extension of the substrate prior to weathering. Results indicated that stresses applied to the film must be substantially relaxed during subsequent weathering and that the hypothesis of continuous build-up of stress in the weather films was not substantiated. It was suggested that the continuous breaking and remaking of linkage, through continuing oxidation processes, tended to reknit the polymer structure and thus to stabilise it in the strained condition. The reknit structure was then capable of absorbing further stresses before rupture. This behaviour would be expected to be shown to the greatest degree by simple oil films and to diminish as the proportion of reactive material in the film is decreased. Experience with films consisting wholly of drying oil when compared with varnish films of decreasing oil length under conditions of slow oxidation supported this view. Thus, after long periods short oil varnish films showed cracking and open checking while oil films remained intact and only eroded comparatively slowly.

It seemed a logical extension to suggest that the comparatively early breakdown experienced with certain of the hydrocarbon resin-modified films might be caused by retained reactivity falling to a level at which stress relaxation by chemical rearrangement of the structure became unlikely. Early chalking developed in some of the films would therefore be caused by something more like a microscopic checking type of failure rather than by oxidative scission process characteristic of oil paints and long oil alkyds.

Optimum Composition

This had led to the idea that there was an optimum composition beyond which dilution of the reactive oil portion of the molecular structure results in a fall in durability. This optimum dilution would be expected to vary with molecular size of the inert diluent and its distribution among and mode of attachment to the oil component and hence the freedom of movement of the oil chain elements of the structure. Therefore a greater proportion by weight of relatively small and evenly distributed phthalate groups could be tolerated in the alkyd structure than of large natural resin molecules in oil varnish. It was not unreasonable also to consider inert pigments as another form of inert diluent so that, as the pigment content was raised, it might be advisable for optimum durability to increase the oil length of the binder.

Films hardened by evaporation of solvent. Properties of soluble polymers when used as paints or lacquers could not be divorced from the way in which the film was formed. Difficulties experienced in application as continuous adherent films have restricted the use as surface coatings of many of the more resistant, flexible plastics, such as polythene, nylon and Terylene.

Factors controlling adhesion of paint films. It was only possible to state adhesion force levels approximately, noted Bullett and Rudram, but measurements made at the Paint Research Station and elsewhere suggested that the maximum attainable, under the best conditions, for non-polar materials such as polystyrene was probably of the order of 5,000 lb./in^2. In practice, with films cast from

Previous reports of the O.C.C.A. Biennial Conference held at Edinburgh appeared in 'Chemical Age,' 9 May, p. 781, 16 May, p. 827 and 23 May, p. 863.

solution at room temperature adhesion measured for the fully dried film was about 500 lb./in.^{2} for polystyrene and 2,000 lb./in.^{2} for polyvinyl acetate.

If it was accepted that the force of adhesion was reduced by an amount equal to the stress build-up in the drying film, then it became clear why a non-polar coating applied from solution had a very low safety margin in respect of adhesion.

The highly polar polymers were necessarily hydrophilic, tended to poor chemical resistance, and generally in respect of properties other than adhesion might be thought less suitable for industrial protective coatings. The logical approach would seem to be to bring the polymer to a fluid condition at some stage after the bulk of volatile material had left the film. This would enable the shrinkage stresses to be relaxed and should ensure that only stresses caused by differential thermal expansion coefficients remained in the film. Careful control of plasticiser and solvent compositions so as to delay the gelation point until the greatest possible proportion of volatiles had evaporated might also repay study for films required to dry at normal temperatures. Successful hot-spray application in thick films of some lacquers indicated another possible approach.

Interesting Solutions

Two other interesting solutions were seen in the methods recently developed to apply thick plastics coatings to steel. One method used a tack coat, i.e., an adhesive which was tacky at the time of union to bond a p.v.c. foil to the steel. The second method, the plastisol technique, could be said to use a fluid p.v.c. lacquer, but it avoided shrinkage stresses associated with the usual solvent systems by starting with a dispersion of the solid resin in a fluid which ultimately, after heating to fusion, constituted the plasticiser. Several other new techniques for successful application of non-polar polymers mentioned included flame-spraying of powdered resins and dipping heated articles in fluidised beds of powdered resins.

For wider use, emulsion polymer systems provided one answer and development of a water-soluble emulsion thickener, which converted readily after application and without undue loss of flexibility to a water-resistant material, could greatly extend the possibilities of emulsion polymer systems, it was reported.

Organo-metallic systems. Success of the conventional zinc tetroxychromate/polyvinyl butyral/phosphoric acid etch primer systems suggested that there should be other possibilities along the same lines and that many of the coatings of the future might be based on the concept of formation of organo-metallic complexes at the interface. This concept might be widened to include complexing or chemisorption of organic coatings with a wide variety of substrates, including wood and plaster.

Chemical reaction type coatings. Such coatings, as exemplified in the polyester systems, offered, it was suggested, the nearest approach yet developed to tailor-made coatings in which the tailoring could actually be done on the surface.

Future developments. Drying oil modified resins might give particularly suitable structures where high durability was required in paint applied to dimensionally variable substrates. The most widely used media for general purpose paints were likely to be resins of relatively simple structure containing no material either readily volatile or extractable by water and subject to no chemical changes on exposure. Certain of the more rubbery acrylic resins were possibly, at present, the nearest approaches to this ideal, but none yet developed appear to have the potentiality to sweep oil-modified systems out of use, regardless of economic factors. Drying oil and oil-modified alkyd from which low-molecular weight polar material was partially replaced by simple non-drying oil or ester-type plasticisers had given good results in terms of initial film formation and durability.

1958 Plastics Materials Sales in U.K. Show 6% Rise : Exports up by 9%

NET sales of plastics materials in the U.K. last year totalled 416,000 tons, more than 22,000 tons, or 6% higher than in 1957. The rate of expansion was considerably less than in 1957 when sales rose by 17% compared with the previous year, but was comparable with the increase of 7% between 1955 and 1956.

The Board of Trade reports a distinct check in second quarter sales, following a rise of nearly 8% in the first quarter of the year. For the second quarter net sales were at the same level as in the same period of 1957, although production remained high. In the third quarter, net sales were slightly higher than a year earlier, but in the last quarter of the year they showed a marked recovery both in the home and export markets (with exports rising to a record 34,000 tons).

Total exports in 1958, excluding plastics waste and scrap, were nearly 115,000 tons, almost 9% up on 1957. Imports also increased sharply to over 41,000 tons, about 24% higher than in the previous year; this rise was largely accounted for by O.E.E.C. countries.

Main expansion in 1958 sales was in thermoplastic materials, which were up by almost 10%. Within this group, by far the largest increase was in sales of polythene which rose by nearly 33½% more than in 1957. Sales of acrylic plastics, polystyrene and p.v.c. were also substantially higher.

Sales of thermosetting materials were at about the same level as in 1957. Of the three types which account for the bulk of this output, sales of alkyds were slightly higher, while sales of aminoplastics and phenolic and cresylic plastics slightly lower. Decline in sales of casein plastics continued. Sales of polyesters on the other hand continued to expand rapidly and were about 48% above the level of the 1957.

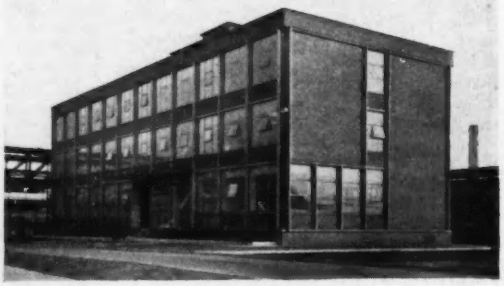
Thermosetting Materials	1957	1958
	'000 *Tons*	
Alkyds	43.5	44.7
Aminoplastics	50.5	49.9
Phenolics & cresylics	66.7	65.4
Polyesters	3.2	4.7
Other	6.4	6.3
Total Thermosetting	170.2	171.0
Thermoplastic Materials		
Cellulose plastics	12.3	11.6
Polyvinyl chloride	66.2	73.3
Polystyrene	31.1	33.2
Other	113.4	126.6
Total Thermoplastic	223.0	244.6
Total all Plastics Materials ...	393.1	415.6

Clayton Aniline's New Dyehouse

NEW premises built as part of a modernisation scheme for the Clayton Aniline Co. Ltd., Manchester, were opened on 19 May by Dr. Robert Käppeli, chairman of CIBA Ltd., Basle, the parent company.

The whole of the ground floor is occupied by a dyehouse which has among many interesting features a pneumatic system for deliveries of samples from the factory and despatch of reports. A preliminary evaluation is done by spectrophotometer and samples are then given a series of tests to ensure perfect standardisation.

Research laboratories take up the whole of the first floor and there is room for expansion on the second floor.



New laboratories and dyehouse of Clayton Aniline Co. Ltd.

EQUIPMENT REVIEW

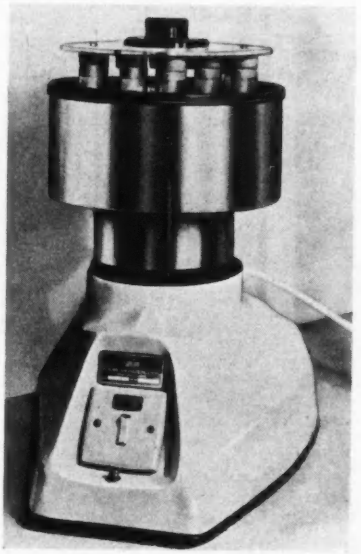
Chemical Plant: Laboratory Equipment: Control and Indicating Apparatus

MECHANICAL DISINTEGRATOR FOR TABLETS

A TABLET disintegrator has been designed by **Calmic Engineering Co. Ltd.,** Crewe, Cheshire, to satisfy the specification laid down by the British Pharmacopœia for the mechanical disintegration of tablets.

The unit is composed of two polished stainless steel circular tanks, one fitted inside the other, the inner tank carrying the disintegration fluid in which the tablets are immersed at the prescribed intervals (30 times per minute). The outer tank is filled with water and carries an immersion heater and thermostat. The latter is pre-set and provides the exact temperature control on the disintegration fluid.

These tanks are supported on a corrosion-resistant glass fibre machine casing enclosing a single phase geared motor and needle roller bearing 'scotch yoke' mechanism. This provides the vertical movement to the tablet tubes through a non-corrosive shaft running in self-lubricating bearings.



Calmic tablet disintegrator

A control panel is fitted to the front of the casing and houses a neon heater indicator light with switches for the immersion heater and electric motor.

This machine has been designed for prolonged use in conditions associated with tablet disintegration and will require a minimum of maintenance beyond the cleaning of the inner tank, which is quickly detachable.

IMPROVED METERING ACCURACIES

BY installing a new high-performance diaphragm on their differential converter transmitters, **Honeywell Controls Ltd.,** Ruislip Road East, Greenford, Middlesex, have raised flow and liquid metering accuracies.

The 'pneumatic balance' digerential converter, which previously contained a Fluon-coated diaphragm separating high and low pressure chambers, now uses Viton as a diaphragm coating. Honeywell's production engineers have found that the new diaphragm provides better long-term stability of measurement and higher stability under varying temperatures.

The chemical resistance of the new diaphragm is good, and it can be used to meter alkalis, amines, hydrocarbons, and dilute or concentrated mineral acids.

The Teflon-coated diaphragm remains available as an option for metering substances, which might attack the new diaphragm.

NEW SOLVENT-RESISTING PAINT

DETEL S/R Grade, is new high-duty solvent-resisting paint coating produced by **Detel Products Ltd.,** Stonefield Way, Victoria Road, South Ruislip, Middx. It is resistant to a wide range of solvents, including trichloroethylene, perchlorethylene, toluole, xylole, white spirit, benzole, butanol, cyclohexanane, amyl acetate and naphtha.

It may be air-dried or stoved and a catalyst is normally used for best results. In the case of trichoroethylene or perchlorethylene, stoving is not essential but best resistance to other solvents will be achieved if the coating is stoved at 120°C for 30 minutes. When air-dried, it will be found to be touch-dry quite quickly, but it does not reach maximum resistance to trichloroethylene until a curing period of about seven days at approximately 65°F has elapsed.

No special surface preparation is necessary, degreasing with solvent being quite adequate. Even on polished aluminium, adhesion appears to be particularly good. Two coats of the paint should normally be applied allowing, in the case of air-dried films, an interval of at least six hours.

GENERAL-PURPOSE WATER BATH

CHARLES HEARSON and Co. Ltd., 68 Willow Walk, London, S.E.1, have added to their range of temperature-controlled apparatus a completely new stainless-steel general-purpose water bath.

The bath is of matt polished stainless steel of welded construction, the top being integral with the working space. The outer casing is of mild steel welded construction, rustproofed and finished in hammer pattern silver-grey stove enamel. Heating is by means of a 1,000-watt matt-type element which ensures even application of heat over the whole bottom of the working space: the windings are so wound as to minimise the watts-density per square inch, thus increasing the life of the heater.

The working space is large, 18 in. by 12 in. by 7½ in. deep (overall dimensions are 23 in. by 14 in. by 9½ in. deep) and has been designed to take standard racks; it is insulated from the outer case by fibre-glass slabs.

Controls are situated at one end of the bath and consist of a thermostat setting knob working on a nominal scale and mains and control lamps of the insert type.

The hydraulic type thermostat controls the bath temperature and all settings from ambient to boiling point, with an accuracy of within ±0.5°C.

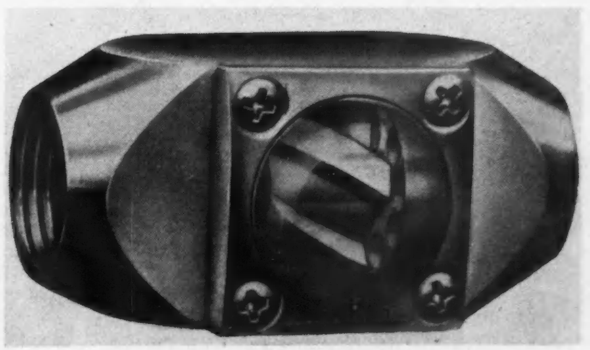
VISUAL FLOW INDICATOR

AN inexpensive and even more compact version of the Telicator liquid flow indicator has been added to the range available from **Sir W. H. Bailey and Co. Ltd.,** Albion Works, Patricroft, Manchester, the sole agents and distributors for the manufacturers, Dukes and Briggs Engineering Co. Ltd.

The unit is designed for insertion in pipelines, the ends being threaded ¼ in., ⅜ in. or ½ in. B.S.P.T., and for use with liquids having temperatures up to 80°C. It can be used with high or low pressure systems and with liquids of almost any viscosity.

One of the main advantages over previous models is that it can be completely dismantled for cleaning without breaking the pipe connections.

The new unit—known as K-type—is



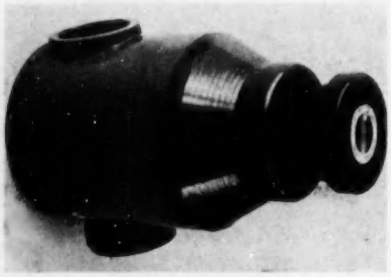
Telicator liquid flow indicator made by Sir W. H. Bailey and Co. Ltd.

only 2¾ in. long and contains a Perspex cylinder housing a rotor which is located by pivots and sprung bearings, so that the flow of a liquid is readily revealed by the revolving rotor. The method of pivoting the rotor is claimed to reduce friction to a minimum, so that the rate of flow of a liquid is hardly affected.

CUP-TYPE PLASTICS VALVES

CUP-TYPE valves designed by **Barflo Ltd.,** 56 Cavendish Place, Eastbourne, Sussex, are made entirely of plastics, and without metal parts, making them suitable for acid runs and installations where corrosion precludes metal.

A range of sizes from nominal pipe size ½ in upwards and plain, threaded or flanged entry are available.



Barflo plastics valve

CONTINUOUS WEIGHT FEEDER

MATERIALS ranging from fine powders to rock products can be handled by a continuous-weight feeder announced by the **Richardson Scale Co. Ltd.,** Albert Street, Bulwell, Nottingham.

The capacity of the standard model is up to an equivalent of 1,000 cu. ft. per hour by weight. It can be supplied in open form, or can be totally enclosed. The accuracy varies according to the output and nature of the material being handled, but an average figure is ±½% over a two-minute period.

A flanged belt is fitted as standard and self-aligning oil-packed ball races are fitted throughout.

For granular materials a gravity feed from a feed hopper is used and in this case an automatic stream depth regulator controls the height of material passing over a weigh roller so as to keep the weight discharged per revolution of the driving pulley, constant.

To control the feed of flushy powdery materials on to the belt a variable-speed screw feeder is supplied. Richardson screw feeders are usually designed so that flush vents can be incorporated into the design of the feed hoppers. Expanding flight pitches are arranged so that an even take-away across the whole hopper outlet area is achieved.

In the case of both gravity- and screw-fed machines the feed rate correcting mechanism is driven from the weigh conveyor pulley in order to prevent feed 'hunting' at low belt speeds. This is particularly important when the output from continuous-weight feeders are controlled from a remote position, by means of a variable-speed drive to the weigh belt. When a continuous-weight feeder is supplied with a variable-speed screw feeder and remote output control, a novel driving arrangement is fitted which drives both belt and screw so that for large rapid changes in output the weight section is neither overloaded nor starved instantaneously.

PROCESS SEQUENTIAL SAMPLER

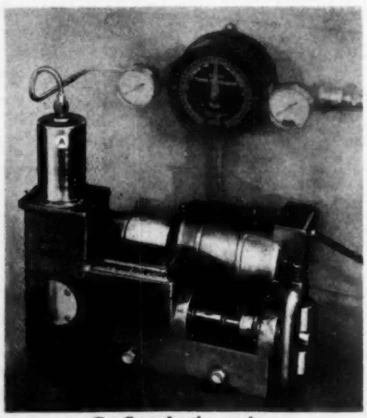
A PROCESS sequential sampler made by the **Gelman Instrument Co.,** Chelsea, Michigan, U.S.A., is designed to cut down the work required in taking dust samples from smoke stacks and process vents. Twelve dust samples are automatically collected in sequence on 2-in. filter discs. The programme of sample collection is easily set by the operator. Air may be sampled at a rate of 2 to 4 c.f.m. depending on the accessory vacuum pump used.

The process sequential sampler is used in air pollution, health physics, industrial hygiene safety, and process efficiency studies. It is available optionally with a heated chamber surrounding the filter-holders. This prevents moisture condensation when sampling saturated streams. The filter used may be glass fibre, cellulose, porous plastics membrane or asbestos depending on the sampling problem.

AUTOMATICALLY CONTROLLED METERING PUMPS

THE DCL 'M' range of metering pumps produced by the **Distillers Co. Ltd.,** Great Burgh, Epsom, Surrey, has been adapted for automatic control. Developed primarily for the accurate metering of small quantities of fluids, the new range can now be operated with pH, temperature, flow and other controls.

The pumps are responsive to pneumatic signals of from 3 to 15 p.s.i.g., adjustment of the plunger stroke being carried out by a compact bellows motor operating through a mechanism designed to reduce 'hunting'. Available with different plunger sizes giving a range of capacities from 0-750 cc./hour to 0-37.3 litres/hour, the pumps are suitable for working pressures up to a maximum of 2,400 p.s.i.g., the maximum pressure depending on capacity. The output from each pump is proportional to the air pressure, the control gear being designed to give maximum capacity at either 3 or 15 p.s.i.g. Pumps heads are interchangeable.



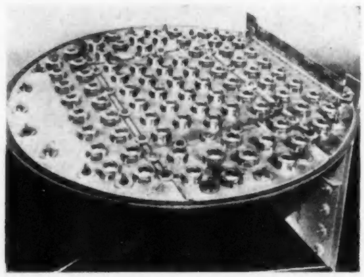
Barflo plastics valve

Power is provided by a 1/15 h.p. totally enclosed induction motor. The suction and delivery valves, both of which are duplicated, are of 12% chromium non-corrodible steel balls specially lapped to ensure high volumetric efficiency. Valve bodies, seats and the valves themselves can be readily removed by merely slackening one set screw.

As with other types of DCL 'M' pumps, hydraulically operated diaphragm heads are available for applications where it is desirable to avoid having glands in contact with the liquid being pumped. The pumps are particularly suitable in connection with chemical and antibiotic manufacturing processes, water treatment, catalyst injection and similar operations.

BALLAST TRAY OF NEW DESIGN

FROM the makers of the Glitsch truss-type bubble cap tray, **Metal Propellers Ltd.,** 74 Purley Way, Croydon, Surrey, a ballast tray of new design has already been brought into use in a wide variety of processes on petroleum refining and petrochemical duties.



Glitsch ballast tray

The ballast tray can be roughly described as a bubble cap tray in which the cap and riser assembly is replaced by a unit producing constant vapour velocity through a variable annular slot. It can also be classed as a sieve tray with apertures which are sealed at zero vapour rates. It is claimed that the ballast trav incorporates the virtues of both bubble cap and sieve trays, and avoids their weaknesses, and that operating tests have shown its efficiency at very low vapour rates up to moderate vapour rates to be higher than any other tray of similar capacity. A turndown ratio of up to 9:1, and better, is obtainable.

POLYTHENE TRAYS AND BINS

Two models have been added to the range of Engel moulded polythene containers by **White, Child and Beney Ltd.,** Shepley Works, Audenshaw, near Manchester. Model 538, a 20-gallon bin, is available in flexible or high density (rigid) grade polythene and is designed with a square body so that it occupies the minimum space for the capacity provided, but with a round plinth base so that the bin may be moved by rolling when heavily loaded. Model 515, a stacking tray, 24 in. by 14 in. by 6 in. approximately, is also available in flexible or rigid polythene.

Overseas News

AMORPHOUS STRUCTURE OF CELLULOSE CLAIM CONFIRMED BY SOVIET CHEMISTS

SOVIET chemists claim that experiments over the last few years have confirmed their hypothesis of the amorphous structure of cellulose and its derivatives. This was reported at a national conference of chemists working on polymers held recently at Tashkent. This city, the capital of Uzbek Republic, is becoming a major centre for research into polymers.

It was claimed that the series of experiments refuted widely-held views on the crystalline structure of cellulose. The hypothesis, it was said, was proved by X-ray structural analysis and investigation of temperature conditions on the dissolution of cellulose and its derivatives.

Laboratories were able to define the density of the pack of molecular chains of cellulose throughout all its stages of formation. This, it was claimed, had given chemists the key to solving various intricate problems affecting the reaction of cellulose with other substances.

An example of this with practical significance was given by chemists from Tashkent. They reported that they had obtained cheap fabrics resembling wool by adding to cellulose "substances" (unnamed) containing nitrogen.

A member of the Uzbek Academy of Sciences, Mr. Usmanov, said experimental proof had been obtained that this process applied to cotton fibre had given it completely new qualities and had eliminated a number of its disadvantages:—its poor resistance to heat, liability to rot and to crease, rapid fading of dyes, inflammability and low resistance to acids.

Mr. Usmanov said that as a result it would be possible to produce in Russia in the very near future cotton fabrics in no way inferior to nylon. Even fire-resistant suits could be made from cotton.

He also reported that experiments had shown that under certain conditions cellulose could combine with any chemical and that this capacity was considerably enhanced by irradiation with radioactive isotopes.

Italy Gets Russian Fibre Plant Contract

A £6 million plant for the manufacture of viscose rayon type cord at Saratov has been ordered by the U.S.S.R., from Chatitton, one of Italy's largest rayon manufacturers. Specifications for this plant are stated to be the same as a similar plant which is being supplied by a Courtaulds' subsidiary; the plant will have a daily capacity of 50 tons of high tenacity viscose cord.

It is also reported that the Soviet Union are buying from Snia Viscosa a complete plant for the production of synthetic fibres at a cost of £6 million.

Under negotiation is a third contract for the supply of a complete petrochemical plant by Italy's Montecatini group.

West German Nitrogen Plant To Be Closed

The nitrogen producing plant of the Krupp Kohle-Chemie GmbH, at Warne-Eickel, West Germany, which belongs to the Krupp concern, is to be closed down indefinitely from the beginning of June.

Closure of this plant, which was built only a few years ago at this Ruhr town, is due to the difficult market situation in nitrogen fertilisers, the company states.

Anglo-Israel Co-operation

The Israeli Ministry of Development and Israel Mining Industries Ltd. have signed a preliminary agreement with Baker Perkins Ltd., of Peterborough concerning the production and marketing of a bromine compound.

A new process worked out at the laboratories of Israel Mining Industries Ltd. will be utilised as it is considered the least costly evolved so far and thus is likely to allow extensive exploitation of rich bromine beds existing in Israel.

Shell to Build £20 Million Refinery in N.Z.

Projected developments in New Zealand include a £20 million oil refinery to be built by the Shell group and the formation of a company to establish an iron and steel industry using the country's ironsands.

The refinery will supply more than 90% of New Zealand's petroleum requirements and is planned to start operating by 1964. It will process imported crude oil. Petrochemicals will not be produced at first.

Hoechst's New Brazilian Interest

Farbwerke Hoechst have purchased the interest of the U.S. concern W. R. Grace in Fongra Productos Quimicos S.A., of Susano, State of Sao Paulo, Brazil. This firm was established a few years ago jointly by the two companies for the manufacture of basic chemical materials.

E.N.I. Plans for Utilising Crude Oil of Gela

Technicians of A.N.I.C., of the E.N.I. Group, Italy, have, after consultations with U.S. chemical engineers, concluded that the best way of utilising the rich-in-bitumen crude oil of the wells at Gela, Sicily, would be to transform it into chemical products.

E.N.I. are willing to build on the spot a plant for this purpose, but in view of the heavy investment involved, they will probably do this only if the Sicilian Government reduces the royalties which were fixed at a time when it was not known that the Gela oil would be of such poor quality.

Processing Sulphur Waste

While detergents give rise to foaming troubles at sewage works, a new technique reported from the U.S., utilises addition of surface-active agents to sulphite chemical waste streams as a means of preventing pollution. The use of detergent speeds up sulphite oxidation.

Sodium sulphite waste is now being oxidised to sodium sulphate by the Sherwin-Williams Co., at their Chicago plant. The waste, from β-naphthol manufacture, contains the sodium salt of β-naphthalene sulphonic acid which acts as a surfactant and facilitates dispersion of air in the liquid waste. The technique has also been tested on a sulphite waste stream from a new *p*-cresol works, where even better results have been effected using a wetting agent than in oxidising sulphite wastes. Strict control is required to prevent excessive foaming.

International Sulphur Institute

Producers of pyrites and sulphur attended a meeting held in Paris on 22 May with the object of forming a non-profit making International Sulphur Institute.

Agreement was reached to proceed with the formation of such an institute with the object of discovering new uses and extending the application of existing uses of sulphur in all forms throughout the world. It will be some time, however, before the constitution and membership can be finally established.

Chemicals and F.T.A.

Professor Ulrich Haberland, chairman of the West German Chemical Industry's Association, has stated that a Common Market in chemicals did not make sense unless Great Britain and Switzerland were included.

Professor Haberland, who is among West Germany's most vocal advocates of the Free Trade Area, made the statement at the shareholders' meeting of the Bayer concern of which he is general manager.

The interest of the chemical industry in the F.T.A. is illustrated by the fact that the national chemical associations of the Common Market countries and those of the F.T.A. countries have established a joint bureau in Zurich.

U.S.-Dutch Chemical Firms Combine

P. J. Schuytvlot and Zoon, chemical engineers, Haarlem, have merged with Fluor Corporation Ltd., Los Angeles, under the name of Fluor Schuytvlot N.V. A 10-storey building is to be erected for the new company at Haarlem.

Another agreement between Dutch and U.S. firms is for the formation of a new company by the Albatros Superphosphate Works of Utrecht and the Cyprus Mines

Corporation of Los Angeles. The company, to be called Albatros Sulphuric Chemical Works, will build a sulphuric acid plant at Pernis, near Rotterdam, with a capacity of 120,000 tons concentrated sulphuric acid.

Belgian Company's Record Polythene Film Sales

Total production of the Belgian company Société Industrielle de la Cellulose Sidac in 1958 was the second highest in the company's history and only 5% less than the record of 1957. Sales of polythene film were a record, but prices of polythene, acetate cellulose and viscose film were all lower than in 1957. Net profit was 36.2 million francs (£232,000) compared with £37.2 million francs in 1957. The dividend is unchanged at 100 frs. a share.

Synthetic Manganese Carbonate Now Commercially Available

Synthetic managanese carbonate in a highly pure form is now available in commercial quantities from Baird Chemical Corporation, 10 West 33rd Street, New York 1. This material is particularly suited for ferrites and steatites because of its very high purity and narrowly defined particle size.

Ferrite manufacture would start with red iron oxide to which is added this synthetic manganese carbonate. This combination, while retaining the basic spinel-type crystal structure of magnetite, provides materials with greatly increased values of permeability, saturation and resistivity, special shaped hysteresis loops, resistance to demagnetisation and combinations of other magnetic properties. Trace impurities of silica, clay, alumina, etc., are in most cases highly detrimental. Only the fact that the raw materials are synthetic rather than natural ores makes possible the high performance, reproducibility and reliability found in modern ferrites.

Battelle Study on Industrial Use of Depleted Uranium

A study to determine how and in what quantities industry may use depleted uranium (material from which most of the fissile U.235 has been removed) for non-nuclear peaceful purposes has been authorised by the Atomic Energy Commission. The study, to be completed in June, is being conducted for the Commission by Battelle Memorial Institute, Columbus, Ohio. The study implements the Commission's decision to remove restrictions on non-nuclear uses of uranium and make it available to industry on an unclassified basis.

Depleted uranium is now available in the form of uranium hexafloride "in substantial annual tonnage on a continuing basis" and may be processed to the metal, oxide, or any desired compound. Uranium and its compounds had limited use prior to World War II in such applications as a colouring agent in glass and glazes, as a component in some ferrous and nonferrous alloys, and as a chemical agent in photographic films, negatives, and prints, according to Dr. Harlan W. Nelson, who is co-ordinating the study at Battelle. A maximum of about 100 tons of uranium were used annually for such purposes before wartime restrictions prohibiting such use were put in force.

In their study of non-nuclear industrial uses for depleted uranium, Battelle are calling upon their research specialists in metallurgy, chemistry, ceramics, solid-state physics, and economics. Traditional industrial uses for depleted uranium will be reviewed, but at the same time, to get a more accurate picture of the future market potential for this material, new or improved applications will be considered. Organisations contemplating the use of depleted uranium or its compounds are invited to make such information available to the Battelle survey team.

Chile's Estimated Nitrate Production

Chile's production of nitrate for the year to 30 June 1959 is estimated at 1,350,000 tons and has been sold at a price of U.S. $30 per ton c.i.f., in the U.S. and in European countries.

New Electrolytic Cells Will Raise Chlorine Tonnage

Plans for an investment of more than $6 million in the Niagara Falls chemical facilities of Olin Mathieson Chemical Corporation include installation of the most modern electrolytic cells for the production of chlorine and caustic soda. The new cells will occupy less space and make possible an increase in chlorine tonnage. They also will permit the production of an even higher quality product.

Much of the electrochemical research that led to the development of the new Mathieson electrolytic cells now installed in the corporation's McIntosh, Ala., and Saltville, Va., plants was done at Niagara Falls.

West Germany Withdraws 16% Superphosphate

As from 1 June 16% superphosphate will be withdrawn from the West German market and replaced by 18% superphosphate. Prices will be reduced at the same time. It is stated that a financial contribution can no longer be made by the German authorities to the sales of the 16% material.

U.S. and Mexican Companies Merge

The Refractories Co. of Mexico is to fuse with the United States chemical concern Kaiser Aluminum and Chemical Corporation, the Kaiser shareholders having given their consent to such a merger.

French-Italian Co-operation

Société d'Etudes de la Propulsion par Reaction and the Italian Bombrini-Parodi-Delfino have come to a technical agreement concerning the production of a solid propellent for jet engines.

Soda Ash Factory for Formosa

A soda ash factory is being built at Suao on the east coast of Formosa and is expected to begin production in July.

Chromium-nickel Steel Helps Improve Quality of Urea Manufacture

PRODUCED commercially by synthesis from ammonia and carbon dioxide, urea has long plagued its manufacturers with corrosion problems. At the new Sohio (Standard Oil, Ohio) petrochemical plant in Lima, Ohio, this difficulty is now reported to have been largely solved through the use of nickel-containing materials.

The 120-ton-a-day Sohio unit cost $17 million to build and is the first installation of this kind in the U.S. to use the Inventa process, licensed in U.S. to Vulcan Engineering Division of Vulcan-Cincinnati-Inc., Cincinnati, Ohio. In this process, liquid ammonia and gaseous carbon dioxide are fed to the urea synthesis reactor and subjected to high pressure and temperature. This reactor, previously, had corroded rapidly. Lead or silver linings partially overcame the problem, but were never completely satisfactory due to high maintenance costs and the possibility of product contamination. A high nickel base alloy was therefore selected which has been found to practically eliminate corrosion and does not require frequent replacement.

The product leaving the reactor is a mixture of water, urea and ammonium carbamate. This is passed through a decomposer and the resulting solution of pure urea and water passes to the Turbafilm processor. Thus by a continuous process, in one pass and in a few seconds, it is dehydrated to a concentration of more than 90% of solids. The Turbafilm processor, manufactured by Rodney Hunt Machine Co. of Orange, Massachussets, is described as an integral part of the new Sohio installation. The cylinder is 20 ft. long, 3 ft. in diameter, and has an inside cladding of chromium-nickel stainless steel. In addition to the lining, '18.8' austenitic stainless steel is used for the main rotor body, blades, and shafts, all piping, nipples and fittings, etc., all surfaces which might be in contact with the urea.

From the processor, urea concentrate is pumped to the prilling tower where it is formed into small shot or pellets. These are dried, cooled, screened, and after a final dusting with conditioning agent to prevent caking, are bagged or packed.

Daily production at Sohio of urea solutions, anhydrous ammonia, nitric acid, dry ice and liquid carbon dioxide totals more than 1 million lb.

Plea for Greater Co-operation Between Producer and Merchant

GREATER co-operation between chemical manufacturers and merchants in the interests of expanding exports of British chemicals was urged by Sir William Garrett, director, Monsanto Chemicals Ltd., and vice-chairman, Association of British Chemical Manufacturers, at the annual luncheon on Tuesday of the British Chemical and Dyestuffs Traders' Association. There was a record attendance of 427 members and guests and Sir William was proposing the toast of the association.

The activities of the chemical merchants were complementary to those of the manufacturer. There were two ways in which both could work closer together, suggested Sir William. The larger manufacturers had their world-wide sales organisations. There were, however, many medium and small firms willing and anxious to play their part. They could collaborate further with the merchants in order to find export markets for their products. Such problems assumed special significance in view of the Common Market and growing competition from West Germany.

Sir William also suggested that more of the association's members might open overseas offices directed from this country to facilitate the distribution of British-made chemicals and to keep an ear to the ground for new sources of raw materials required by the manufacturer.

£1,100 m. Capital Investment

Referring to the great strides made by the British chemical industry to increase and diversify production since the 1920's, he declared that the full impetus of the industry's expansion had been particularly in evidence in the past 10 years during which time the chemical and allied industry had invested £1,100 million in new capital equipment. The fact that chemicals were now the third largest exporting industry in Britain was due in no small measure to the association and its merchant members who had found markets in all parts of the world.

Mr. G. S. Bache, president of the association, responding to the toast, deprecated the fact that the recent mission to Moscow headed by Sir David Eccles did not include any representative of the British merchanting interests.

Referring to the deadlock on the free trade area proposals, he said these might well resolve themselves into an association now being termed as the 'outer seven'. It might be that such an association would meet some accord with the existing Common Market.

Toast of the guests was proposed by Mr. D. F. Waugh, association chairman, who regretted that Mr. Victor Blagden their founder president was unable to be present. He added that Mr. Blagden would celebrate his 92nd birthday on Thursday (28 May).

Referring to the free trade negotiations, he declared "We do not want any blocs in Europe. We want to trade with all the countries on terms that are equal to all comers." He expressed concern, however, that Russia and her satellites should be trading as governments, at cheaper prices for political ends.

Toast of the guests was replied to by Lord Macintosh of Halifax, president of the National Savings Committee.

Draft Standards Circulated for Comment

DRAFT standards circulated by the British Standards Institution for comment and possible modification before publication include:

CZ 5632—Ammonia distillation apparatus (Markham) (revision of B.S. 1428, part B.2). *CZ 5633*—Nitrogen determination apparatus (micro-Kjeldahl) revision of B.S. 1428, part B.1). *CZ 5803*—Method for the determination of the relative viscosity of nylon 6.6 in 90% formic acid.

CZ 6007—Rubber (polymer) determinations (revision of part of B.S. 903). *CZ 6008*—Determination of manganese in compound rubbers.

Import Duty Procedure Criticised

CRITICISM of the present system of dealing with exemptions from import duty was expressed by Mr. Denis Waugh (Tar Residuals Ltd.) in presenting the annual report to the general meeting of the British Chemical and Dyestuffs Traders' Association in London on Tuesday, 26 May.

In negotiations with the Board of Trade, he said, the association had stressed the viewpoint that a higher import duty should not be levied on a product merely because it was classified for the first time with products formerly on the Key Industry Duty list. This point of view was accepted in principle and a long list of products had been granted temporary exemption from duty.

The exemption procedure caused much dissatisfaction, however, because it created uncertainty. Much of this could be avoided by extending the period of time covered by exemption renewal orders. Moreover, an exemption should be renewed automatically until circumstances, ascertained by consultation with all interested parties, fully justified the re-imposition of duty.

The Safeguarding of Industries Act of 1921, having served its purpose, should have been repealed, because as long as it remained in operation the manufacturing side of the industry was encouraged to retain a protectionist complex. Its retention made adjustment to the present-day policy of expansion in international trade more difficult.

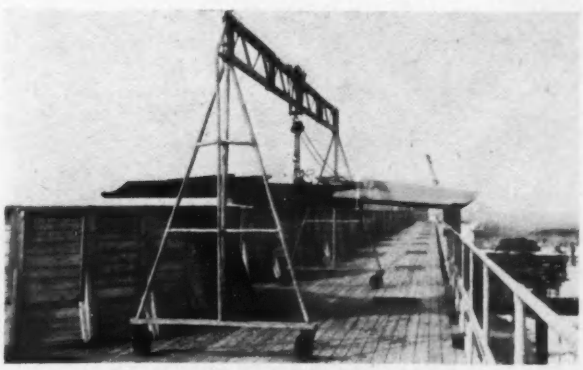
Mr. Waugh said that applications for anti-dumping duties against pentaerythritol and tartaric acid were still being examined. The danger of anti-dumping action was that it could be misused to conceal protection, and it could become an issue of great importance in the working of a European free trade area.

Portable Cooling Tower Maintenance Gantry

TO aid cooling tower maintenance, Head Wrightson Processes Ltd., a subsidiary of Head Wrightson and Co. Ltd., have developed a portable cooling tower gantry.

The removal of the induced draught fan and fan drive gear box for inspection and maintenance necessitates rigging up suitable tackle which normally causes delays in bringing the tower back into service, and to speed this operation the Head Wrightson Com-Pact gantry has been designed.

An essential feature is the ability to manhandle the various components to the fan deck of the tower for assembly, and this has been done by making the main beam in short sections. When not in service on the cooling tower this equipment can be used for many lifting purposes.



Head Wrightson portable gantry in operation on a large cooling tower at a Government works

PEOPLE in the news

● The appointment of first professor of nuclear engineering at Manchester University has been given to Mr. William Bateman Hall, deputy chief scientific officer in the research laboratories of the U.K. Atomic Energy Authority at Sellafield. Mr. Hall was an engineering apprentice with Manchester Ship Canal Co. and received his technical training at Manchester College of Technology.

● Officers elected at the annual general meeting of the British Chemical and Dyestuffs Traders' Association on Tuesday, 26 May, are: President, Mr. G. S. Bache (joint managing director, Reichhold Chemicals Ltd.); vice-presidents, Mr. C. W. Lovegrove and Mr. H. Gilliat; chairman, Mr. D. F. Waugh (Tar Residuals Ltd.); vice-chairman, Dr. C. J. Bell; hon. treasurer, Mr. Kingsley Williams; council—Mr. J. Berthoud, Mr. D. E. Flaherty, Mr. C. Fountain and Mr. B. B. Keegan.

● Mr. S. H. Elliott, managing director of H. J. Elliott Ltd., Treforest, Glam, left London on 20 May on an extended tour of Denmark, Sweden, Norway and Finland, to visit stockists and distributors of E-Mil volumetric laboratory glassware, thermometers and hydrometers. He is expected to return on about 12 June, and will then be making a flying business visit to France on 26 June.

● Mr. D. N. Gifford, commercial manager, has been appointed a director of Birlec-Efco (Melting) Ltd., Aldridge, Staffs.

● Mr. L. E. Gardner, chief chemist, Edgar Allen and Co. Ltd., Imperial Steel Works, Sheffield 9, is on a six-months visit to the cement plant at Doroud of the Seven-Year-Plan Organisation of Iran. Equipment for this plant was largely supplied by Edgar Allen.

● Mr. D. J. S. Hartt (May and Baker Ltd., Dagenham) has been elected president of the Industrial Pest Control Association for 1959/60. Other officers are: vice-president, G. A. Campbell (Geigy Co. Ltd.); honorary treasurer, S. Farrow (London Fumigation Co Ltd.); executive committee, D. Boocock (Standardised Disinfectants Co. Ltd.); S. W. Hedgcock (Disinfestation Ltd.); C. A. E. Stuart Kregor (W. Edmonds and Co. Ltd.); D. M. Simpson (Cooper, McDougall and Robertson Ltd.); H. D. H. Womack (Shell Chemical Co. Ltd.). Immediate past president is A. Fraser McIntosh (Thomas Harley Ltd.).

● Mr. Roger Williams, Jr., president of Roger Williams Technical and Economic Services, Inc., Princeton, New Jersey, U.S., is leaving for Europe on June 7 to address the Société de Chimie Industrielle. His subject will be 'Chemical market research—an international aid to management'. While abroad he will consult with numerous organisations in France, Belgium, and the U.K. He will also attend the British Plastics Exhibition.

● Mr. W. McLeod has been appointed assistant managing director of Saturn Industrial Gases and its subsidiary, H. G. Sanders and Son. Mr. E. W. Young, secretary of Saturn Industrial Gases, has been appointed to the boards of both companies.

● Dr. E. S. Hedges, director of the International Tin Research Council, left last week for Spain to deliver two lectures on recent developments in the chemical technology of tin. The first, on 26 May, was given in Barcelona to a joint meeting of the University Science Faculty and the Spanish Technical Association for Metallurgical Studies. On 9 June he will address in Madrid the Spanish equivalent of D.S.I.R. Dr. Hedges will deliver both lectures in Spanish.

● Mr. Charles M. Doscher has been appointed sales manager of chemicals by Dow Chemical International Ltd., S.A., Midland, Mich. In this new position, he will be responsible for planning and directing sales of industrial, intermediate and special chemicals in export markets.

● Bristol University Council has appointed Dr. E. W. Abel to be lecturer in inorganic chemistry, Mr. A. M. J. N. Blair to be junior fellow in pharmacology and Dr. J. T. Martin to be reader in chemistry of insecticides and fungicides.

● Dr. Basil V. de G. Walden, B.Sc., Ph.D., F.R.I.C., chief European representative of the Hooker Chemical Corporation, who as stated in p. 891, have just opened a London office, joined Albright and Wilson as a research chemist on receiving his Ph.D. at London University in 1939. Three years later he was appointed technical officer in Armaments Research and Development with the Ministry of Aircraft Production. Returning to Albright and Wilson in 1945, he was named manager of the European Development Department and in 1956 joined E.I. du Pont de Nemours in London as European research associate; he was also appointed joint secretary of Du Pont (United Kingdom) in 1957. Dr. Walden is assistant hon. secretary of the London section, Society of Chemical Industry.

Dr. Walden

● Mr. R. L. Ledger, principal officer at the Dominion Laboratory, New Zealand Department of Scientific and Industrial Research, and head of the chemical engineering section, is making a three-month tour of the U.K. He is visiting chemical works and research departments, including some atomic research establishments.

● New chairman of the Association of Manufacturers of British Agricultural Chemicals is Mr. George Huckle, Shell Chemical Co. Ltd.; the new vice-chairman is Mr. H. C. Mellor, Plant Protection Ltd.

Obituary

Mr. Harry Curtis, B.Sc., Tech., A.R.I.G., A.M.I.Chem.E., director of Leda Chemicals Ltd. responsible for production and chemical engineering, died on 20 May, aged 39. Leda Chemicals are a subsidiary of F. W. Berk and Co. Ltd.

Duke of Edinburgh at Chemstrand Plant

The Duke of Edinburgh visited the new Acrilan acrylic fibre plant of Chemstrand Ltd. at Coleraine, Northern Ireland, on 21 May. He is seen here touring the chemical area of the plant with, l. to r., C. H. Goodwin, general project manager, C. Downing, manufacturing superintendent, and T. H. Makepeace, general works manager. The Duke unveiled a plaque "to the cause of lasting friendship between the English-speaking peoples and the prosperity of Northern Ireland"

BRITISH CHEMICAL PRICES

GENERAL CHEMICALS

Acetic Acid. D/d in ret. barrels (tech. acid barrels free); in glass carboys, £8; demijohns, £12 extra. 80% tech., 10 tons, £97; 80% pure, 10 tons, £103; commercial glacial, 10 tons, £106.
Acetic Anhydride. Ton lots d/d, £128.
Alum. Ground, f.o.r., about £25.
MANCHESTER: Ground, £25.
Aluminium Sulphate. Ex-works, d/d, £15 10s to £18.
MANCHESTER: £16 to £18.
Ammonia, Anhydrous. Per lb., 1s 9d-2s 3d.
Ammonium Chloride. Per ton lot, in non-ret. pack, £33 2s 6d.
Ammonium Nitrate. D/d, 4-ton lots, £31.
Ammonium Persulphate. Per cwt., in 1-cwt. lots, d/d, £6 13s 6d; per ton, in min. 1-ton lots, d/d, £123 10s.
Ammonium Phosphate. Mono-and di-, ton lots, d/d, £106 and £97 10s.
Antimony Sulphide. Per lb., d/d UK in min. 1-ton lots: crimson, 4s 9½d d/d to 5s 2¾d; golden, 3s ½d d/d per lb. to 4s 5½d d/d.
Arsenic. Ex-store, £45 to £50.
Barium Carbonate. Precip., d/d, 4-ton lots, bag packing, £41.
Barium Chloride. 2-ton lots, £46.
Barium Sulphate [Dry Blanc Fixe]. Precip. 2-ton lots, d/d, £39.
Bleaching Powder. Ret. casks, c.p. station, in 4-ton lots. £30 7s 6d.
Borax. Ton lots, in hessian sacks, c.p. Tech., anhydrous, £68; gran., £46; crystal, £48 10s; powder, £49 10s; extra fine powder, £50 10s; BP, gran., £55 10s; crystal, £57 10s; powder, £58 10s; extra fine powder, £59 10s. Most grades in 6-ply paper bags. £1 less.
Boric Acid. Ton lots, on hessian sacks, c.p. Tech., gran., £76 10s; crystal, £84 10s; powder, £82; extra fine powder £84; BP gran., £89 10s; crystal, £96 10s; powder, £94; extra fine powder, £96. Most grades in 6-ply paper bags, £1 less.
Calcium Chloride. Ton lots, in non-ret. pack; solid and flake, about £15.
Chlorine, Liquid. In ret. 16-17 cwt. drums d/d in 3-drum lots, £41.
Chromic Acid. Less 2½%, d/d UK, in 1-ton lots, per lb., 2s 2¾d.
Chromium Sulphate, Basic. Crystals, d/d, per lb., 8½d; per ton, £79 6s 8d.
Citric Acid. 1-cwt. lots, per cwt., £11 5s. 5 cwt. lots per cwt. £11; packed in jute bags or five ply paper bags, both with polythene liners, 1 cwt. lots, per cwt. £10 17s; 5 cwt. lots per cwt. £10 12s.
Cobalt Oxide. Black, per lb., d/d, bulk quantities, 13s 2d.
Copper Carbonate. Per lb., 2s 2d.
Copper Sulphate. F.o.b., less 2% in 2-cwt. bags, £76.
Cream of Tartar. 100%, per cwt., about £11 12s.
Formaldehyde. In casks, d/d, £40
Formic Acid. 85%, in 4-ton lots, c.p., £91.
Glycerine. Chem. pure, double distilled 1.2627 s.g., per cwt., in 5-cwt. drums for annual purchases of over 5-ton lots and under 25 tons, £11 1s 6d. Refined technical grade industrial, 5s per cwt. less than chem. pure.
Hydrochloric Acid. Spot, per carboy, d/d (according to purity, strength and locality), about 12s.
Hydrofluoric Acid. 60%, per lb., about 1s 2d.
Hydrogen Peroxide. Carboys extra and ret. 27.5% wt., £119 0s 0d; 35% wt., d/d, £143.
Iodine. Resublimed BP, under 1 cwt., per lb., 14s 1d; for 1-cwt. lots, per lb., 13s 2d; 5 cwt., per lb., 12s 8d.

These prices are checked with the manufacturers, but in many cases there are variations according to quality, quantity, place of delivery, etc. Abbreviations: d/d, delivered; c.p., carriage paid; ret., returnable; non-ret. pack., non-returnable packaging; tech., technical; comm., commercial; gran., granular.

All prices per ton unless otherwise stated

Iodoform. Under 1 cwt., per lb., £1 2s 4d, for 1-cwt. lots, per lb., £1 1s 8d, 5 cwt., per lb., 21s 1d, crystals, 3s more.
Lactic Acid. Pale tech., 44% by wt., per lb., 14d; dark tech., 44% by wt., per lb., 9d; chem. quality, 44% by wt., per lb., 12½d; 1-ton lots, ex-works, usual container terms.
Lead Acetate. White, about £154.
Lead Nitrate. 1-ton lots, about £135.
Lead, Red. Basis prices: Genuine dry red, £104 5s; orange lead, £116 5s. Ground in oil: red, £125 5s, orange, £137 5s.
Lead, White. Basis prices: Dry English in 5-cwt. casks, £116; Ground in oil: English, 1-cwt. lots, per cwt., 194s.
Lime Acetate. Brown, ton lots, d/d, £40; grey, 80-82%, ton lots, d/d, £45.
Litharge. In 5-ton lots, £106 5s.
Magnesite. Calcined, in bags, ex-works, about £21.
Magnesium Carbonate. Light, comm., d/d, 2-ton lots, £84 10s under 2 tons, £97.
Magnesium Chloride. Solid (ex-wharf), £17 10s.
Magnesium Oxide. Light, comm., d/d, under 1-ton lots, £245.
Magnesium Sulphate. Crystals, £16.
Mercuric Chloride. Tech. powder, per lb., for 5-cwt. lots, in 28-lb. parcels, £1 1s 9d; smaller quantities dearer.
Mercury Sulphide, Red. 5-cwt. lots in 28-lb. parcels, per lb., £1 10s. 6d.
Nickel Sulphate. D/d, buyers UK, nominal, £170.
Nitric Acid. 80° Tw., £35 2s.
Oxalic Acid. Home manufacture, min. 4-ton lots, in 5-cwt. casks, c.p., about £133.
Phosphoric Acid. Tech. (s.g. 1.700) ton lots, c.p., £100; BP (s.g. 1.750), ton lots, c.p., per lb., 1s 4d.
Potash, Caustic. Solid, 1-ton lots, £95 10s; liquid, £36 15s.
Potassium Carbonate. Calcined, 96/98%, 1-ton lots, ex-store, about £76.
Potassium Chloride. Industrial, 96%, 1-ton lots, about £24.
Potassium Dichromate. Gran., per lb., in 5-cwt. to 1-ton lots, d/d UK, 1s 2¼d.
Potassium Iodide. BP, under 1-cwt., per lb., 8s; per lb. for 1-cwt. lots, 7s 3d.
Potassium Nitrate. 4-ton lots, in non-ret. pack, c.p., £63 10s.
Potassium Permanganate. BP, 1-cwt. lots, per lb., 1s 11¼d; 3-cwt. lots, per lb., 1s 10¾d; 5-cwt. lots, per lb., 1s 10½d; 1-ton lots, per lb., 1s 10d; 5-ton lots, per lb., 1s 9½d. Tech., 5-cwt. in 1-cwt. drums, per cwt., £9 15s 6d; 1-cwt. lots, £10 4s 6d.
Salammoniac. Ton lot, in non-ret. pack, £47 10s.
Salicylic Acid. MANCHESTER: Tech., d/d, per lb., 2s 6½d, 1-ton lots.
Soda Ash. 58% ex-depot or d/d, London station, 1-ton lots, about £16 11s 6d.
Soda, Caustic. Solid 76/77%: spot, d/d 1-ton lots, £33 16s 6d.
Sodium Acetate. Comm. crystals, d/d, £75 8s.
Sodium Bicarbonate. Ton lot, in non-ret. pack, £21 10s.
Sodium Bisulphite. Powder, 60/62%, d/d 2-ton lots for home trade, £46 2s 6d.
Sodium Carbonate Monohydrate. Ton lot, in non-ret. pack, c.p., £64.
Sodium Chlorate. 1-cwt. drums, c.p. station, in 4-ton lots, about £79.
Sodium Cyanide. 96/98%, ton lot in 1-cwt. drums, £126.
Sodium Dichromate. Gran. Crystals per lb., 1s. Net d/d UK, anhydrous, per lb., 1s 1¾d. Net. del. d/d UK, 5-cwt. to 1-ton lots.
Sodium Fluoride. D/d, 1-ton lots and over, per cwt., £5; 1-cwt. lots, per cwt., £5 10s.
Sodium Hyposulphite. Pea crystals, £38; comm., 1-ton lots, c.p., £34 15s.
Sodium Iodide. BP, under 1 cwt., per lb., 13s; 1-cwt. lots, per lb., 12s 9d; 5 cwt., per lb., 12s 3d.
Sodium Metaphosphate [Calgon]. Flaked, paper sacks, £133.
Sodium Metasilicate. (Spot prices) D/d UK in 1-ton lots, 1-cwt. free paper bags, £29.
Sodium Nitrate. Chilean refined gran. over 98%, 6-ton lots, d/d c.p., per ton £29.
Sodium Nitrite. 4-ton lots, £32.
Sodium Perborate. (10%0) in 1-cwt. free kegs, cwt. lots, £129 10s.
Sodium Percarbonate. 12½% available oxygen, in 1-cwt. kegs, £170 15s.
Sodium Phosphate. D/d, ton lots: di-sodium, crystalline, £40 10s, anhydrous, £88; tri-sodium, crystalline, £39 10s, anhydrous, £86.
Sodium Silicate. (Spot prices) 75-84° Tw. Lancs and Ches., 6-ton lots, d/d station in loaned drums, £12 10s; Dorset, Somerset and Devon, per ton extra, £3 5s; Scotland and S. Wales, extra, £2 17s 6d. Elsewhere in England, not Cornwall, extra, £1.
Sodium Sulphate [Desiccated Glauber's Salt]. D/d in bags, about £19.
Sodium Sulphate [Glauber's Salt]. D/d, up to £14.
Sodium Sulphate [Salt Cake]. Unground, d/d station in bulk, £10.
MANCHESTER: d/d station, £10 10s.
Sodium Sulphide. Solid, 60/62%, spot, d/d, in drums in 1-ton lots, £36 2s 6d; broken, d/d, in drums in 1-ton lots, £37 2s 6d.
Sodium Sulphite. Anhydrous, £71 10s; comm., d/d station in bags, £27-£28 10s.
Sulphur. 4 tons or more, ground, according to fineness, £20-£22.
Sulphuric Acid. Net, naked at works, 168° Tw. according to quality, £10-£11 12s 6d; 140° Tw., arsenic free, £8 7s 6d; 140° Tw., arsenious, £8 2s 6d.
Tartaric Acid. Per cwt.: 10 cwt. or more, £14 10s; 1 cwt., £14 15s.
Titanium Oxide. Standard grade comm., rutile structure, £178; standard grade comm., anatase structure, £163.
Zinc Oxide. Max. for 2-ton lots, d/d, white seal, £97 10s; green seal, £95 10s; red seal, £92 10s.

SOLVENTS AND PLASTICISERS

Acetone. All d/d. In 5-gal. drums, £128; in 10-gal. drums, £118; in 40-45 gal. drums, under 1 ton, £93; 1-5 tons, £90; 5-10 tons, £89; 10 tons and up, £88; in 400-gal. tank wagons, £85.
Butyl Acetate BSS. 10-ton lots, £173.
***n*-Butyl Alcohol BSS.** 10 tons, in drums, d/d, £149.
***sec*-Butyl Alcohol.** All d/d. In 5-gal. drums, £168; in 10-gal. drums, £158; in 40-45 gal. drums, under 1 ton, £133; 1-5 tons, £130; 5-10 tons, £129; 10 tons and up, £128; in 400-gal. tank wagons, £125.

tert-**Butyl Alcohol.** 5-gal. drums, £195 10s; 40/45-gal. drums: 1 ton, £175 10s; 1-5 tons, £174 10s; 5-10 tons, £173 10s; 10 tons and up, £172 10s.

Diacetone Alcohol. Small lots: 5-gal. drums, £185; 10-gal. drums, £175. 40/45-gal. drums: under 1 ton, £148; 1-5 tons, £147; 5-10 tons, £146; 10 tons and over, £145, in 400 gal. tank wagons, £142.

Dibutyl Phthalate. In drums, 10 tons, d/d, per ton, £210; 45-gal. drums, d/d, 1-4 drums, £216.

Diethyl Phthalate. In drums, 10 tons, per ton, £187 10s; 45-gal. drums, d/d, 1-4 drums, £193 10s.

Dimethyl Phthalate. In drums, 10 tons, per ton, d/d, £179, 45-gal. drums, d/d, 1-4 drums £185.

Dioctyl Phthalate. In drums, 10 tons, d/d, per ton £284; 45-gal. drums, d/d, 1-4 drums £290.

Ether BSS. 1-ton lots, drums extra, per lb., 1s 11d.

Ethyl Acetate. 10-ton lots, d/d, £145.

Ethyl Alcohol [PB 66 o.p.]. Over 300,000 p. gal. 4s 0¼d; d/d in tankers, 2,500-10,000 p. gal. per p. gal., 4s 2¾d. D/d in 40/45-gal. drums, p.p.g. extra, 1d.
Absolute alcohol (75.2 o.p.), p.p.g. extra, 5d.

Methanol. Pure synthetic, d/d, £43 15s.

Methylated Spirit. Industrial 66° o.p.: 500-gal. and up, d/d in tankers, per gal., 5s 10½d; 100-499 gal. in drums, d/d, per gal., 6s 3d-6s 5d. Pyridinised 66° o.p.: 500 gal. and up, in tankers, d/d, per gal., 6s 2d; 100-499 gal. in drums, d/d, pet gal., 6s 6½d-6s 8½d.

Methyl Ethyl Ketone. All d/d. In 5-gal. drums, £183; in 10-gal. drums, £173; in 40/45-gal. drums, under 1 ton, £148; 1-5 tons, £145; 5-10 tons, £144; 10 tons and up, £143; in 400-gal. tank wagons, £140.

Methyl *iso*Butyl Carbinol. All d/d. In 5-gal. drums, £203; in 10-gal. drums, £193; 40-45 gal. drums, less than 1 ton, £168; 1-9 tons, £165; 10 tons and over, £163; in 400-gal. tank wagons, £160.

Methyl *iso*Butyl Ketone. All d/d. In 5-gal. drums, £209; in 10-gal. drums, £199; in 40/45-gal. drums, under 1 ton, £174; 1-5 tons, £171; 5-10 tons, £170; 10 tons and up, £169; in 400-gal. tank wagons, £166.

***iso*Propyl Acetate.** In drums, 10 tons, d/d, £137; 45-gal. drums, d/d, £143.

***iso*Propyl Alcohol.** Small lots: 5-gal. drums, £118; 10-gal. drums, £108; 40/45-gal. drums: less than 1 ton, £83; 1-9 tons, £81; 10-50 tons, £80 10s; 50 tons and up, £80.

RUBBER CHEMICALS

Carbon Disulphide. According to quality, £61-£67.

Carbon Black. 7¼. per lb. ex-works Swansea, 3 ton lots and over, under 3 tons but not less than 1 ton 7½lb ex-works, ex-store, London and Manchester, 8¾d per lb.

Carbon Tetrachloride. Ton lots, £83 15s.

India-Rubber Substitutes. White, per lb., 1s 5¾d to 1s 8d; dark, d/d, per lb., 1s 1½d-1s 5d.

Lithopone. 30%, about £55 10s. for 5 ton lots.

Mineral Black. £7 10s-£10.

Sulphur Chloride. British, about £50.

Vegetable Lamp Black. 2-ton lots, £64 8s.

Vermilion. Pale or deep, 7-lb. lots, per lb., 15s 6d.

COAL TAR PRODUCTS

Benzole. Per gal., min. 200 gal., d/d in bulk, 90's, 5s. 3d; pure, 5s 7d.

Carbolic Acid. Crystals, min. price, d/d bulk, per lb., 1s 4d; 40/50-gal. ret. drums extra, per lb., ½d. Crude, 60's, per gal., 8s 4d..
MANCHESTER: Crystals, d/d, per lb., 1s 4d-1s 7d; crude, naked, at works, 8s 5d.

Creosote. Home trade, per gal., according to quality, f.o.r. maker's works, 1s-1s 9d.
MANCHESTER: Per gal., 1s 2d-1s 8d.

Cresylic Acid. Pale 99/100%, per gal., 6s 8d. D/d UK in bulk: Pale ADF, per imperial gallon f.o.b. UK, 7s 3d per US gallon, c.i.f. NY, 95 cents freight equalised.

Naphtha. Solvent, 90/160°, per gal., 5s. 1d; heavy, 90/190°, for bulk 1,000-gal. lots, d/d, per gal., 3s 11d. Drums extra; higher prices for smaller lots.

Naphthalene. Crude, 4-ton lots, in buyers' bags, nominal, according to m.p.: £19-£30; hot pressed, bulk, ex-works, £40; refined crystals, d/d min. 4-ton lots, £65-£66.

Pitch. Medium, soft, home trade, f.o.r. suppliers' works, £10 10s; export trade, f.o.b. suppliers' port, about £12.

Pyridine. 90/160, per gal., 15s-17s 6d.

Toluol. Pure, per gal., 5s 2d; 90's, d/d, 2,000 gal. in bulk, per gal., 4s 11d.
MANCHESTER: Pure, naked, per gal., 5s 6d.

Xylole. According to grade, in 1,000-gal. lots, d/d London area in bulk, per gal., 5s 11d-6s 2d.

INTERMEDIATES AND DYES (Prices Nominal)

m-**Cresol** 98/100%. 10 cwt. lots d/d, per lb., 4s 9d.

o-**Cresol** 30/31°C. D/d, per lb., 1s.

p-**Cresol** 34/35°C. 10 cwt. lots d/d, per lb. 5s.

Dichloraniline. Per lb., 4s 6d.

Dinitrobenzene. 88/99°C., per lb., 2s 1d.

Dinitrotoluene. Drums extra. SP 15°C., per lb., 2s 1½d; SP 26°C., per lb., 1s 5d; SP 33°C., per lb., 1s 2½d; SP 66/68°C., per lb., 2s 1d.

p-**Nitraniline.** Per lb., 5s 1d.

Nitrobenzene. Spot, 90 gal. drums (drums extra), 1-ton lots d/d, per lb. 10d.

Nitronaphthalene. Per lb., 2s 5½d.

o-**Toluidine.** 8-10 cwt. drums (drums extra), per lb., 1s 11d.

p-**Toluidine.** In casks, per lb., 6s 1d.

Dimethylaniline. Drums extra, c.p., per lb., 3s 5d.

DIARY DATES

THURSDAY 4 JUNE

C.S.—London: Burlington House, Piccadilly, W.1., 7.30 p.m. 'Kinetics and orientation of some epoxide ring opening reactions', by Mr. N. B. Chapman, Mr. N. S. Isaacs and Mr. R. E. Parker; 'Cleavage of substituted phenyltrimethylsilanes by sulphuric acid in acetic acid-water', by Mr. F. B. Deans and Mr. C. Eaborn; 'The heats and entropies of ionisation of some aromatic and *N*-hetero-aromatic amines', by Mr. J. J. Elliott and Mr. S. F. Mason.

Polarographic Soc.—London: Duke of York, Dering St., W.1, 7 p.m. 'Some polarographic problems encountered in a private consulting practice', by Mr. F. Kenyon.

S.A.C.—Berkhamsted: Cooper Technical Bureau, 11 a.m. Visit by Biological Methods Group.

S.C.I.—Stevenage: Water Pollution Research Laboratory: 2 p.m. Visit of Microbiology Group.

FRIDAY 5 JUNE

S.A.C.—Poole: Joint summer meeting of Western Section with Poole Technical Group.

Research Labs. for Cerebos

First research laboratories to be set up by the Cerebos group have been opened in a four-storey building at Colinton, near Edinburgh by Sir Edward Appleton, vice-chancellor of Edinburgh University.

French Resinates and Solvents Available in U.K.

PRODUCTS manufactured by S.A. Sheby, Paris, and now available in the U.K. through Charles H. Windshuegl Ltd., 1 Leadenhall Street, London, E.C.3, include Mouillant 54, a wetting agent said to be active for all pigments and compatible with all media used in paint making.

Advantages claimed include reductions of up to 40% in ball-milling time and absence of any tendency to curtaining or ropiness in white enamels based on zinc oxide.

Other chemicals in the range are:

Calcidur.—Calcium resinate with melting point raised to 150°C and acid value lowered to 70, used for helio inks.

Calmax.—Calcium resinate with melting point 126 to 132°C and acid value 48 to 55, for adhesives, helio inks and inexpensive paints.

Calox.—Neutral calcium resinate believed to be the only standard calcium resinate in which the acidity from abietic acid is totally neutralised.

Zimax.—Neutral zinc resinate with 8% zinc and 2% calcium metal, the high zinc content reducing tendency to yellowing; for varnish oils and helio inks.

Teryl.—Bornyl acetate (technical), a heavy solvent used as an anti-skinning agent in nitro-cellulose varnishes and in paints, polishes and perfumery.

Malester 768.—Abieto-maleic resin with melting point 150° to 155°C and complete solubility in all petroleum solvents with aromatic content above 10%; for paint lacquers and varnishes.

Malester 905.—Complete solubility in ethyl alcohol; for varnishes.

Plastifiant 49.—Liquid plasticiser derived from castor oil, of very low volatility, acid value below 4; for paints, lacquers, leather.

Manganese naphthenate.—One of a series of naphthenate dryers; for paints.

Bergol.—Methyl abietate with uses as plasticiser, resin and solvent in varnishes, paints, chlorinated rubber, linoleum, paper, bitumen, adhesives and plastics.

Berghydrol.—Bergol treated by dehydrogenation and isomerising, has a greater plasticising effect than Bergol.

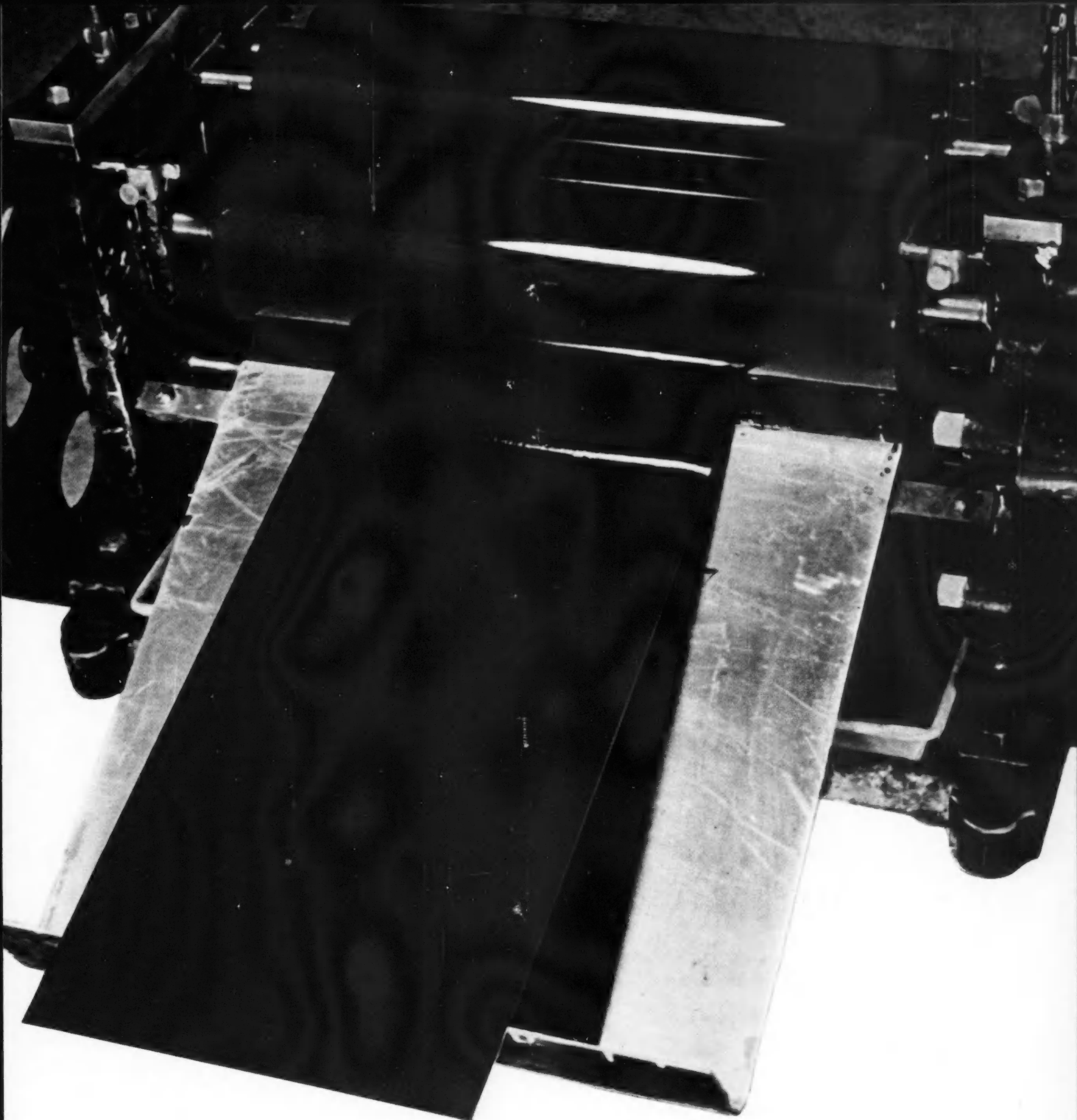
Adhex.—Abietic ester from a polyalcohol of the glycol type, soluble in all common solvents except alcohol; for adhesives.

More Methane from British Coal Mines

BRITAIN'S present 62 plants for the extraction of methane from deep mines are to be increased by about 25 in the next three years.

Methane drainage is primarily intended as a safety measure. It is estimated that about 300 million cu. ft. of methane a day is discharged in U.K. mines. The N.C.B.'s extraction programme is at present draining 104 mil. cu. ft. a week, of which about 42 mil. is utilised.

The new programme is aimed at raising the amount extracted to over 200 million cu. ft., and the amount used to over 150 million.



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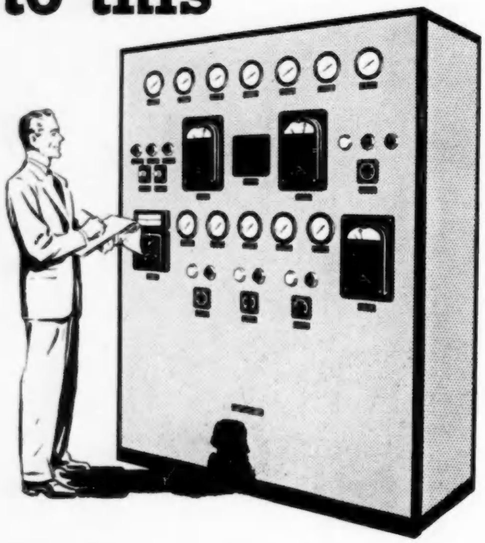
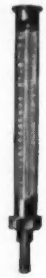
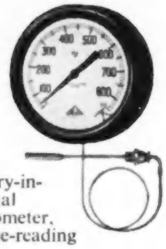


and everything between!

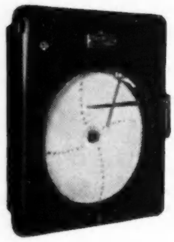
A single thermometer to a complete installation. We produce a wide range of industrial indicating, recording and controlling instruments. Our service includes a contracts department for the engineering and installation of complete instrumentation schemes.



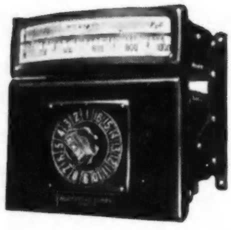
Brass-cased tank and pipe thermometer



Mercury-in-steel dial thermometer, distance-reading type

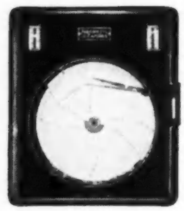


Disc chart pressure recorder



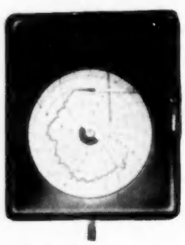
10" multipoint pyrometer indicator

Air-operated mercury-in-steel temperature transmitter



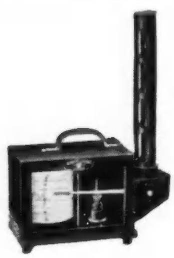
Air-operated compound controller

Dial Pressurestat



"Mersteel" recording thermometer

Valve positioner



Recording hair hygrometer

INSTRUMENTATION BY—

NEGRETTI & ZAMBRA

NEGRETTI & ZAMBRA LIMITED 122 REGENT STREET, LONDON W1

Manufacturers of instruments for the indication, recording, controlling of:— temperature, pressure, liquid level, volume, specific gravity, humidity, etc. Also meteorological and aircraft instruments.

Commercial News

• Beecham Group Profits Up £690,000
• Borax Six-months Profits £1 m. Higher
• No Interim from British Benzol
• Wellcome Bid for Cooper, McDougall

Beecham Group

Group net profit of the Beecham Group advanced from £2,516,397 to £3,207,065 in the year to 31 March 1959, and the dividend is raised from the equivalent of 20% to 24%, with a final of 10%.

Group sales increased from £34,152,816 to £40,407,914, and the group trading profit from £6,093,396 to £6,741,221.

The 1958-59 figures include the trading profit of Thomas and Evans from September 1, 1958, amounting to £399,175. Sales by the grocery shops of Thomas and Evans since the date of acquisition, are not included in the total group sales.

Borax Holdings

Consolidated trading profits of Borax (Holdings) Group in the three months ended 31 March, 1959, amounted to £907,795 compared with £533,382 in the comparable quarter of 1958. This makes a half-year's total of £1,597,633 against £578,957, after charging depreciation of £1,019,886 (£748,219).

Net profit for the three months was £611,841 (£302,091) and for the six months £1,087,231 (£327,623). The directors state that a strong demand for boron products continued in all markets, as a result of the growing economic recovery throughout the world.

In the comparable period of 1958 problems associated with the initial operations of the new plants at Boron (California) led to high costs of production and adversely affected the profits.

British Benzol

The directors of British Benzol and Coal Distillation have decided not to pay an interim dividend in respect of the year ending 31 October 1959. A year ago a 5% interim was followed by a similar final.

After providing for depreciation, a loss was incurred for the first six months of the current year. Trading has since shown a slight improvement and profits, the company states, are now being earned. The question of a dividend will be considered when the full year's results are available.

British Drug Houses

By agreement with the directors of J. R. Gibbs of Paignton, British Drug Houses Ltd. have made an offer for Gibbs capital consisting of 9,254 ordinary £1 shares and 29,405 preference £1 shares. J. R. Gibbs are a private company carrying on business as wholesale chemists and dealers in chemist sundries. If the offer is accepted the acquisition will give B.D.H. control of Ferris and Co.

Burrell and Co.

Manufacturers of chemical colours, Burrell and Co. had a group net profit for 1958 of £103,036 (£72,724), current assets are £979,092 (£858,206) and liabilities £270,171 (£236,731). A dividend of 26% (same) plus a special interim of 2% is being paid.

The company proposes to appoint Mr. G. E. Hither, a technical director, as joint managing director.

Head Wrightson

With a final of 15% (12½%) Head Wrightson and Co. Ltd. are paying 20% for the year ended 31 January (17½%).

Group trading profit on completed work increased to £1,815,173 (£1,735,422). After deduction of tax £636,011 (£835,574), depreciation and pensions provisions, the balance is £874,654 (£722,574).

Manchester Oil Refining

Chairman of Manchester Oil Refinery (Holdings), Mr. R. E. F. de Trafford, referred in his annual statement on 6 May to the termination by the board of Dr. Tugendlat's service agreement as managing director and his subsequent resignation from the board. Dr. Tugendhat's solicitors have now issued the following statement. "On 28 January 1959, Dr. Tugendhat was given leave by a Master of the Queen's Bench Division of the High Court to sign summary judgment for wrongful dismissal against Manchester Oil Refinery (Holdings). Assessment of damages by the Court is now pending, and will be tried this year. The company has already paid Dr. Tugendhat £10,000 generally on account of such damages: an offer of a much larger sum in full settlement has been made and refused. Dr. Tugendhat resigned from the board in March because of serious difference of opinion on matters of policy."

Wellcome Foundation

Directors of Cooper, McDougall and Robertson have received an offer from the Wellcome Foundation for the purchase of all the 824,411 ordinary shares of the company at £2 per £1 share ex the proposed final dividend of 10% and a 2½% capital distribution. The directors, who, with their families own more than 60% of the shares, are accepting the offer.

Simon-Carves

Simon-Carves might find it necessary to review certain of the group's traditional lines and to explore new fields, states Mr. R. B. Potter, chairman. There were, he said, no signs of any large increase in sulphuric acid production and the chemical plant department had concentrated on other types of chemical plant, particularly a large polythene factory in India. An important contract had recently been received for a fertiliser plant in Eire.

So far as nuclear power plant was concerned, the company was spending exceptional sums on research and development "with no real assurance of proper continuity of work in the future." In Europe there were indications that a number of contracts would go to the U.S., apparently because of the more attractive terms being offered both for credit and sale repurchase of fuel elements.

Market Reports

TRADING CONDITIONS CONTINUE STEADY

LONDON Steady trading conditions have again been reported from the industrial chemicals market, with home users calling for good quantities against contracts. Supplies are fairly easy in most sections of the market and the price position remains firm. The last alteration in zinc oxide prices operates from 18 May, and is given in chemical prices.

Demand for agricultural chemicals has been reasonably good, with sulphate of ammonia in steady request on home and export account. Export trade inquiry covering a wide range of chemicals is keeping up to a good level.

MANCHESTER The Manchester market for heavy chemicals during the past week has pretty well resumed normal operations following the quiet spell during Whitsuntide. Traders have handled a fair flow of inquiries and home-trade users are calling for reasonably good deliveries against contracts. There has been little improvement so far, however, in the movement of supplies to the cotton textile and allied industries. A fairly steady demand from overseas is reported. Quotations generally are well held. Fertiliser business is seasonably slacker. In tar products a quietly steady trade is being done.

GLASGOW Trading conditions during the past week were very brisk and the overall position showed some improvement. Demands both against spot and contract requirements were well taken up and covered the usual range of materials. Prices have remained firm with little change. The report on agricultural chemicals is one of continued activity both in regard to enquiries and demands. The export market remains steady, with, however, room for improvement.

NEW PATENTS

By permission of the Controller, HM Stationery Office, the following extracts are reproduced from the 'Official Journal (Patents)', which is available from the Patent Office (Sales Branch), 25 Southampton Buildings, Chancery Lane, London W.C.2, price 3s 6d including postage; annual subscription £8 2s.

Specifications filed in connection with the acceptances in the following list will be open to public inspection on the dates shown. Opposition to the grant of a patent on any of the applications listed may be lodged by filing patents form 12 at any time within the prescribed period.

AMENDED SPECIFICATIONS

On sale 8 July

Adhesive bonding of surfaces or adhesive compositions suitable for use therein. B.B. Chemical Co. Ltd. & ors. **569 666**

Separation of acidic gases from gaseous mixtures. Girdler Corp. **655 401**

Organotin compounds and compositions containing same. Metal & Thermit Corp. **719 421**

ACCEPTANCES

Open to public inspection 8 July

Systems for feeding chemicals in controlled volume. Ladendorf, K. **816 035**

Tertiary amines. [Addition to 807 837.] Thomae Ges. K. **816 168**

Organosilicon polymers. Midland Silicones Ltd. **816 278**

Trimethylolpropane. [Addition to 816 208.] Celanese Corp. of America. **816 209**

Preparation of aminoacetonitriles. Rexolin Chemicals A.B. **816 280**

Coagulation of lignin in aqueous suspension. West Virginia Pulp & Paper Co. **816 281**

Process and preparation of piperazine. Pfizer & Co. Inc., C. **816 037**

Steam cracking of light naphtha and preparation of resins therefor. Esso Research & Engineering Co. **816 038**

β-Diethylaminoethyl ethyl α-phenyl-ethylmalonate. Soc. Italiana Prodotti Schering. **816 317**

Process for production of very pure gallium. Brown, Boveri & Cie. A.G. **816 282**

Lubricating compositions. Esso Research & Engineering Co. **816 318**

Sulphenyl-urea derivatives. Chemische Fabrik Schweizerhall **816 319**

Zone-melting processes. Western Electric Co. Inc. **816 367**

Methods of and apparatus for filtering. Olin Mathieson Chemical Corp. **816 368**

Thiophosphoric acid esters and process for their manufacture. Farbenfabriken Bayer A.G. **816 286**

Therapeutically useful compositions containing reserpine. Koninklijke Pharmaceutische Fabriken Voorheen Brocadesstheeman Pharmacia N.V. **816 040**

Separation of diisopropyl benzene dihydroperoxides. Bataafsche Petroleum Maatschappij N.V., De. **816 200**

Ethylene dibromide preparations and method of treating fruit therewith. Bataafsche Petroleum Maatschappij N.V., De. **816 202**

Heat treatment of titanium alloys. Crucible Steel Co. of America. **815 975**

Pyrimidines and process for their manufacture. Ciba Ltd. [Divided out of 815 976.] **815 977**

Trimethylolpropane. Celanese Corp. of America. [Divided out of 816 208.] **816 210**

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Diazotype processes. Tanenbaum, A., and Royer, R. P. **816 601**

Method of and apparatus for disintegrating solid particles. C.U.R.A. Patents Ltd. **816 389**

Polyamide membranes. National Research Development Corp. **816 572**

Production of raw slurry for use in the manufacture of cement. Smidth & Co., A. S., F. L. **816 474**

Methods for depositing alloy coatings by gas shielded electric arcs. British Oxygen Co. Ltd. **816 391**

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Manufacturing fertilisers from calcium nitrate and urea. Office National Industriel de L'Azote. **816 573**

Liquid treatment of fibrous material. Courtaulds Ltd. **816 674**

Ternary uranium alloy. U.K. Atomic Energy Authority. **816 603**

Apparatus for treatment of strands of fabrics with gases, vapours or liquids. Vlissingen & Co.'s Katoenfabrieken N.V., P. F. Van. **816 703**

Oxydiazole disazo dyestuffs and process for their manufacture. Ciba Ltd. **816 749**

Manufacture of hydrocyanic acid. Toyo Koatsu Industries Inc. **816 731**

Production of sintered magnesia articles from finely divided magnesium compounds. Wintershall, A.G. **816 606**

Benzothiazonemonoazo-diphenylamine compounds and materials dyed therewith. Eastman Kodak Co. **816 396**

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Substituted tetrahydro-1, 4-oxazine compounds. Ravensburg G.m.b.H. **815 576**

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Manufacture of quinuclidine derivatives. Ciba Ltd. **816 504**

Preparing vaccines having a specific tissular reaction. Gauchard, F., and Paquelet, J. H. **816 577**

$\alpha : \alpha$ Diphenyl-β-amine propanols and process for their manufacture. Farbwerke Hoechst A.G. **816 578**

Polymerisation in suspension of vinyl monomers, using graft polymers as dispersing agents. Montecatini Soc. Generale Per L'Industria Mineraria e Chimica. **816 579**

Process for treating materials sensitive to ultraviolet rays. Ciba Ltd. **816 750**

Apparatus for extracting energy from an elastic fluid such as gas. Air Products Inc. **816 507**

Polymeric foamed materials. Imperial Chemical Industries Ltd. **816 680**

Treating silicon steel. General Electric Co. **816 705**

Polymeric polyether-polyurethanes. Du Pont De Nemours & Co., E. I. **816 651**

Lubricant composition. California Research Corp. **816 580**

Process for the preparation of silica sols. Grace & Co., W. R. **816 581**

Boron-removing resin and process for removing boron compounds from fluids. Rohm & Haas Co. **816 510**

Isocyanate-based elastomeric condensation products. Du Pont De Nemours & Co., E. I. **816 652**

Preparation of metals and silicon and germanium from compounds thereof. Eltro G.m.b.H. & Co. Gesellschaft für Strahlungstechnik [Addition to 789 374.] **816 398**

Detergent compositions. Rohm & Haas Co. **816 683**

Method of and apparatus for treating a glass surface. Duplate Canada Ltd. **816 479**

Hypergolic fuel containing mercaptals or mercaptols. California Research Corp. **816 769**

Recovery of vanadium from slag. United Steel Co's Ltd **816 609**

Production of derivatives of phenothiazine. Etablissements Clin-Byla. **816 582**

Production of sulphonated alkylated aromatic hydrocarbons. Continental Oil Co. **816 610**

Storage of liquids. Wimpey & Co. Ltd., G., and Rose, N. K. **816 440**

Siliceous pigments. Columbia-Southern Chemical Corp. **816 686**

Polymerisation of olefins. Phillips Petroleum Co. **816 513**

Production of potassium sulphate. Soc. D'Etudes Chemiques Pour L'Industria et L'Agriculture. **816 611**

Production of an edible fat. Bibby & Sons Ltd., J. **816 514**

Vinyl polymer polyepoxy coating composition. Rohm & Haas Co. **816 630**

Penetrant compositions. Olin Mathieson Chemical Corp. **816 584**

TRADE NOTES

Dorr-Oliver to Move

As from Monday 1 June, the offices of Dorr-Oliver Co. Ltd., at present at Abford House, Wilton Road, London S.W.1, and the Mechanical Engineering Division at 21-22 Manor Mount, Forest Hill, London S.E.23, will move to Norfolk House, Wellesley Road, Croydon, Surrey (Municipal 2488, Grams: Dorroliver—Croydon).

Resin Products

Information about products marketed by British Resin Products Ltd., Devonshire House, Piccadilly, London W.1, is given in three data books. No. 1 deals with Cellobond adhesive and binder resins, No. 2 with Epok surface-coating resins and No. 3 with Rockite, Styron, Tyril and Rigidex moulding materials.

Chemical Engineering Plant

Equipment of many kinds is described in the latest batch of leaflets issued by L. A. Mitchell Ltd., 37 St. Peter Street, Manchester 2.

They cover pneumatic dryers, mechanical pan dryers, mixers, stirrers, pumps, instruments and resin plants.

Water Tests

Simple routine testing of water works operation and control of chlorination in swimming baths are provided for with Palin tablets supplied by Wilkinson and Simpson Ltd., Low Friar Street, Newcastle upon Tyne 1. The tests cover residual chlorine, pH, hardness and alkalinity. Tablets are also available for testing of water used in steam generation.

Steel-Shaw Exhibition in Birmingham

Steele and Cowlishaw Ltd. will display the Steel-Shaw high speed ball mills, Mark I and V, the Steel-Shaw Kady kinetic dispersion mill and the Quickway paint conditioner at the Birmingham Exchange and Engineering Centre, Stephenson Place, Birmingham 2, from 9 to 13 June. The exhibition will be open from 9 a.m. until 9 p.m. except on Saturday, 13 June, when it will close at noon.

Agents for Pigments

Dr. Vogt and Co., Cologne, manufacturers of natural and synthetic pearl essences and pigments, have appointed G W. Bolton Ltd., 4 Broad Street Place, London E.C.2, as their U.K. representatives.

Terylene in Chemical Works

Savings in many industries in money, space, weight, labour time, and even lives are described in the booklet 'Terylene Saves' by the I.C.I. Fibres Division. Examples of use in chemical works include protective clothing with a life of more than ten times that of earlier types and thinner and more flexible conveyor belts with improved qualities of wear and heat resistance.

Guide to Service

Pre-treatment processes, including Bonderizing and Parkerizing, are described in a guide to services issued by the metal finishing division of the Pyrene Co. Ltd., Great West Road, Brentford, Middlesex.

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